FACTORY

MANAGEMENT AND MAINTENANCE

NOVEMBER 1958

A McGRAW-HILL PUBLICATION • ONE DOLLAR

THE MAGAZINE OF PLANT OPERATING MANAGEMENT

PLAN '59

Modernize now for growth and profits

A SPECIAL REPORT FROM McGRAW-HILL TO AMERICA'S BUSINESS EXECUTIVES

MANAGED MODERNIZATION
In a broad program by
34 McGraw-Hill magazines . . .

FACTORY's own approach to modernization — how to plan it, organize it, make it work.
Begins on page 75.

Fairly commonplace in industry today are special hazard areas, where special protection must be provided to assure against possible serious loss by fire. Grinnell, with 88 years' experience protecting against fire hazards of every description, has the most effective extinguishing agents and best systems for each type of hazard.

Remember, too, the installation of the proper Grinnell System usually serves to reduce fire insurance premiums drastically, often pays for itself in a few years!

FREE REFERENCE MANUAL! This new 44-page reference manual — "Special Hazard Fire Protection by Grinnell" — gives you a comprehensive picture of all the most advanced methods for Special Hazard fire protection. It includes explanations, applications, photographs, case histories of Grinnell systems and specialized equipment . . . and a Quick Selector Chart to help you determine the most effective system for your special fire hazard.

Write for your complimentary copy today. Grinnell Company, Inc., 277 West Exchange St., Providence, R. I.

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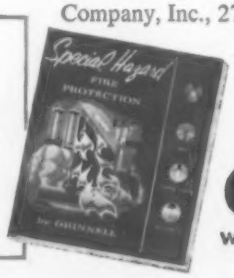
- Dry Chemical Systems
- Control Equipment and Devices
- Quick Selector Chart
- Research and Testing
- Sales, Engineering, Installation and Inspection Service



GRINNELL

WHENEVER FIRE PROTECTION IS INVOLVED

Manufacturing, Engineering, and Installation of Fire Protection Systems since 1870

For more facts circle 446 on READER SERVICE CARD

B.F.Goodrich

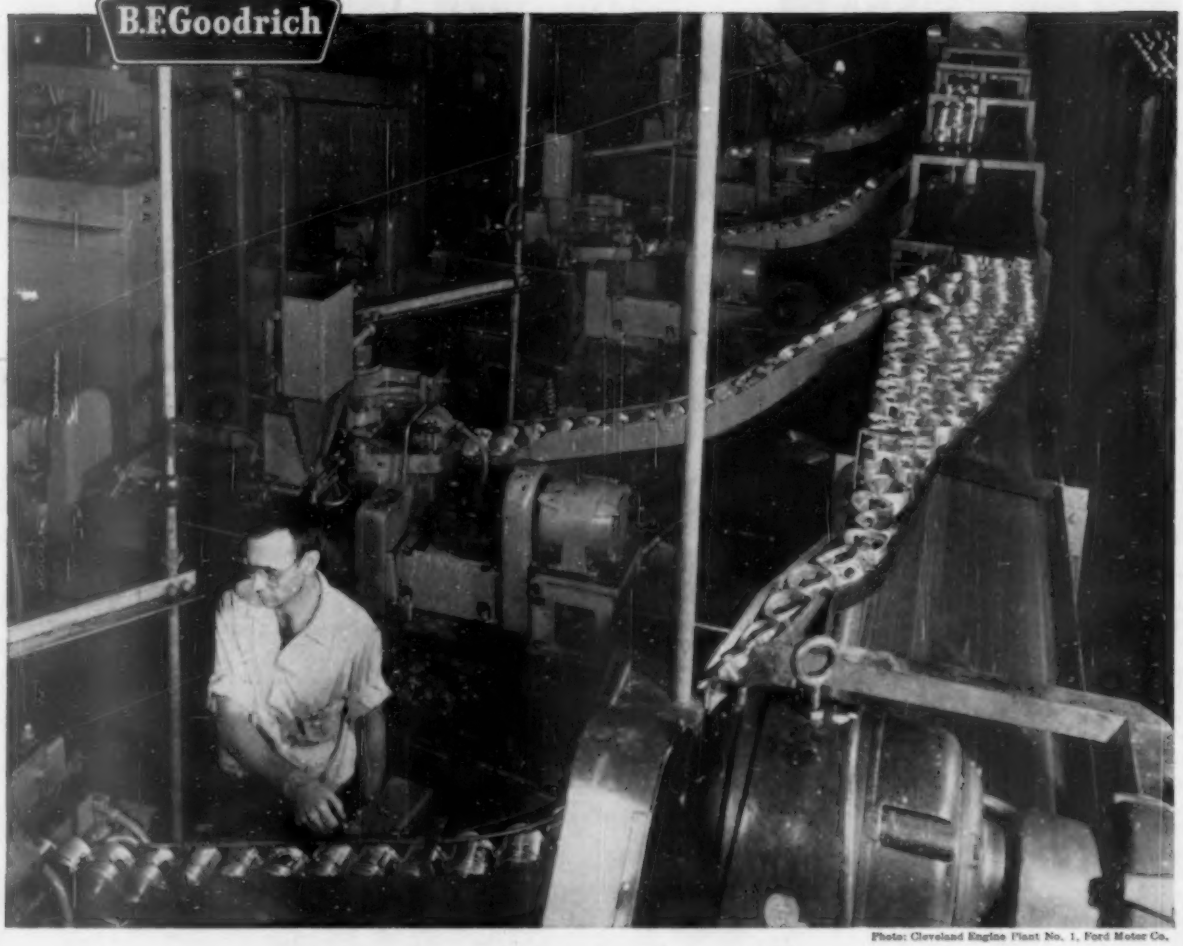


Photo: Cleveland Engine Plant No. 1, Ford Motor Co.

Piston-packing belt helps build new cars

A typical example of B.F.Goodrich product improvement

Problem: The combination of sharp edges and oil on those pistons was ruining conveyor belts in four months. They cut grooves in the belt, ripped it, tore off the fasteners which held the belt together. The oil soaked into the belt cover, softened it, formed a dirty scum on the surface. Belts had to be cleaned and repaired constantly.

What was done: When a B.F.Goodrich distributor heard of the problem, he recommended a new B.F.Goodrich conveyor belt made of Koroseal flexible material. Koroseal resists scuffing, tearing, cutting; it stands oil, grease, most acids and just about everything else that ruins other materials. It can be vulcanized into a continuous belt, eliminating troublesome fasteners.

Savings: Over 2 million pistons have been carried by this Koroseal belt. It's still going strong after a year's service —three times longer than the belt it replaced. Even though this is a premium-priced belt, its cost when measured in terms of useful service is 48% lower than the belting it replaced.

Extra benefits: Because the belt has a smooth, nonporous surface that's easy to clean, "locating holes" in the pistons don't get plugged up with dirt.

Where to buy: Your B.F.Goodrich distributor has the exact specifications for the Koroseal belt described here. And, as a factory-trained specialist in rubber products, he can answer your questions about *all* the many products B.F.Goodrich makes for industry. *B.F.Goodrich Industrial Products Company, Dept. M-441, Akron 18, Ohio.*

Koroseal—T. M. Reg. U. S. Pat. Off.

B.F.Goodrich *industrial products*

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MANAGEMENT AND MAINTENANCE

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THE MAGAZINE OF PLANT OPERATING MANAGEMENT

Edited exclusively for the men with management responsibilty for production and maintenance in the manufacturing industries

PROBLEM-SOLVING GUIDE

THIS SIMPLE FILING SYSTEM is designed to give quick access to past FACTORY articles that can help you solve current operating problems. Here's how it works:

1. All major articles and many short items are classified according to a functional code system (below). Codes cover basic operating responsibilities.

2. Where applicable, articles are also coded (see numbers in parentheses) to show secondary or closely related topics.

3. To use, cut up the items below. Paste them on 3x5-in. cards and file by code number. To cross-index, copy the information on a second card, and file by secondary code.

Note: For suggestions on using this new tool (plus an outline for a more complete decimal filing system), see FACTORY, February 1957, page 104.

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NEW ELPAR TITAN

Fork and Ram Trucks

Capacities: 15,000-20,000 lbs.

Photograph of 16,000-pound-capacity model illustrates compactness and visibility provided by ELPAR Titan series.

ALL NEW.. unsurpassed compactness, visibility, speed, safety

The electric-powered ELPAR Titan R-12 series offers an unequaled combination of features:

For Your Production Department,
NEW OPERATING EFFICIENCY

Box car maneuverability . . . moves easily through 7-foot freight car doors . . . operates in confined areas . . . high travel and lift speeds.

For Your Operator,
NEW OPERATING EASE

"Picture window" vision forward . . . completely unobstructed view to rear and sides . . . dual controls . . . power steering.

For Your Safety Department,
NEW "TRI-SAFE" BRAKING SYSTEM

Safe stops in *every* situation . . . three independent brakes—dynamic, hydraulic and mechanical—*act in sequence* and are controlled by a *single toe bar* extending the width of the operator's compartment.

For Your Maintenance Department,
TRADITIONAL ELPAR DEPENDABILITY

Uprights are forged from high carbon steel . . . spherical self-aligning bearings on inner uprights and elevator reduce wear . . . high mounting of tilt cylinders eliminates upright twist and side sway . . . battery is easily accessible.

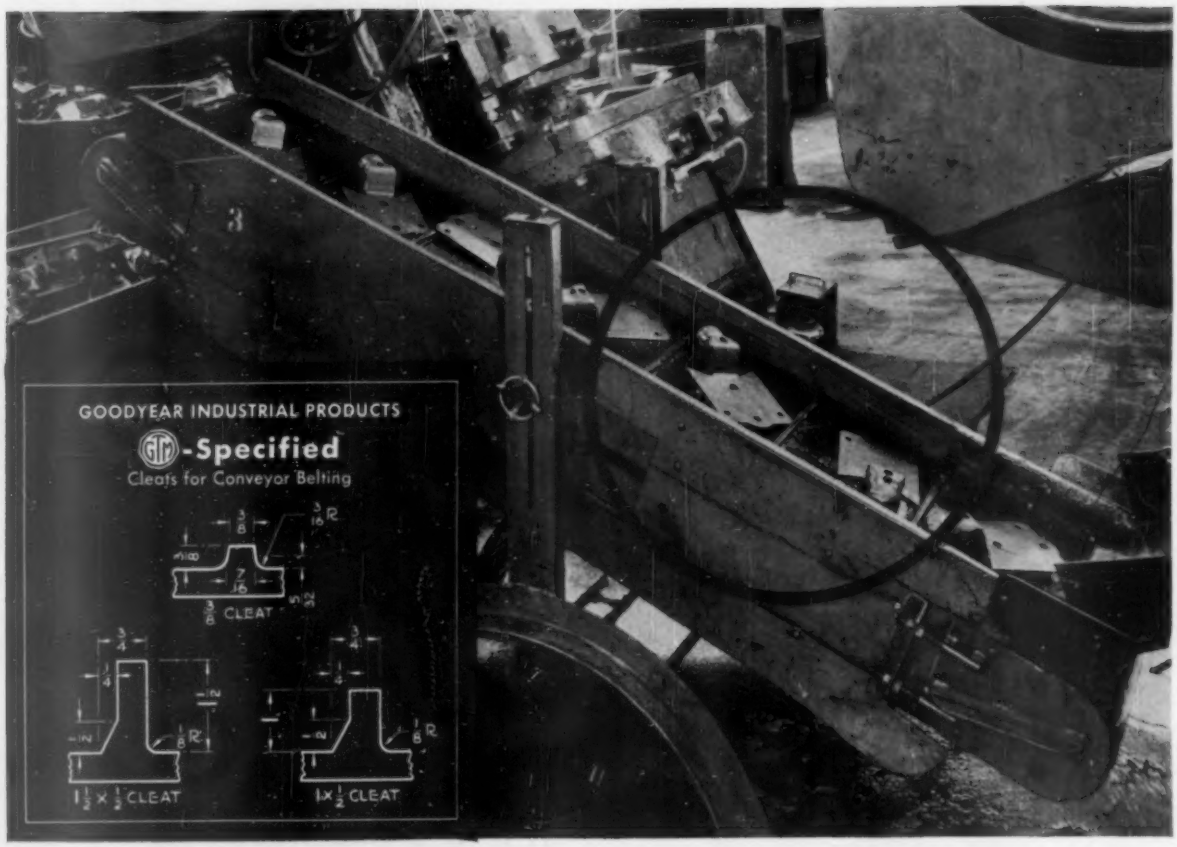
Get complete details . . . SEND FOR TITAN SERIES BULLETIN and "TRI-SAFE" BRAKING BULLETIN

ELPAR ELECTRIC TRUCKS

THE ELWELL-PARKER ELECTRIC COMPANY

4030 St. Clair Avenue • Cleveland 3, Ohio

Twice the Life . . . 1/3rd the Operating Costs



They're raising production—and lowering costs by ⅓

Portable conveyors—between production lines on different levels—were a "must" at this Midwestern automotive parts plant. But the specially constructed belts they used soon cut and flaked off. They became oil-soaked and accumulated dust—dirtying the parts. Worse still, they stretched—had to be taken up every 6 weeks. Even then, none lasted more than a year.

Then the G.T.M.—Goodyear Technical Man—recommended Style ORS Cleated Belts. They're made of rubber especially compounded for extreme resistance to oil, cutting and abrasion. And the tough, firm-gripping cleats are molded right into the rubber for durability.

The savings are impressive: The G.T.M.'s less-expensive belts eliminated the need for parts washing. And after 3 straight years of full service—*three times the life of competitive belts*—they're still going strong.

Like to have savings like these on your production lines? The fastest way to find out is to call the G.T.M. He'll be Johnny-on-the-spot if you contact your Goodyear Distributor—or write Goodyear, Industrial Products Division, Akron 16, Ohio.

• • •

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

CONVEYOR BELTING BY

GOODYEAR

60 GOODYEAR ANNIVERSARY

THE GREATEST NAME IN RUBBER

When a motor we installed single phased, — Fusetron Fuses saved our reputation and a $200 rewind job

C. B. Meldrum, OWNER
MELDRUM ELECTRIC COMPANY
HOUSTON, TEXAS

Mr. Meldrum continues:

"Recently I sent several of my men to install a 50 h. p. air conditioning unit for a customer.

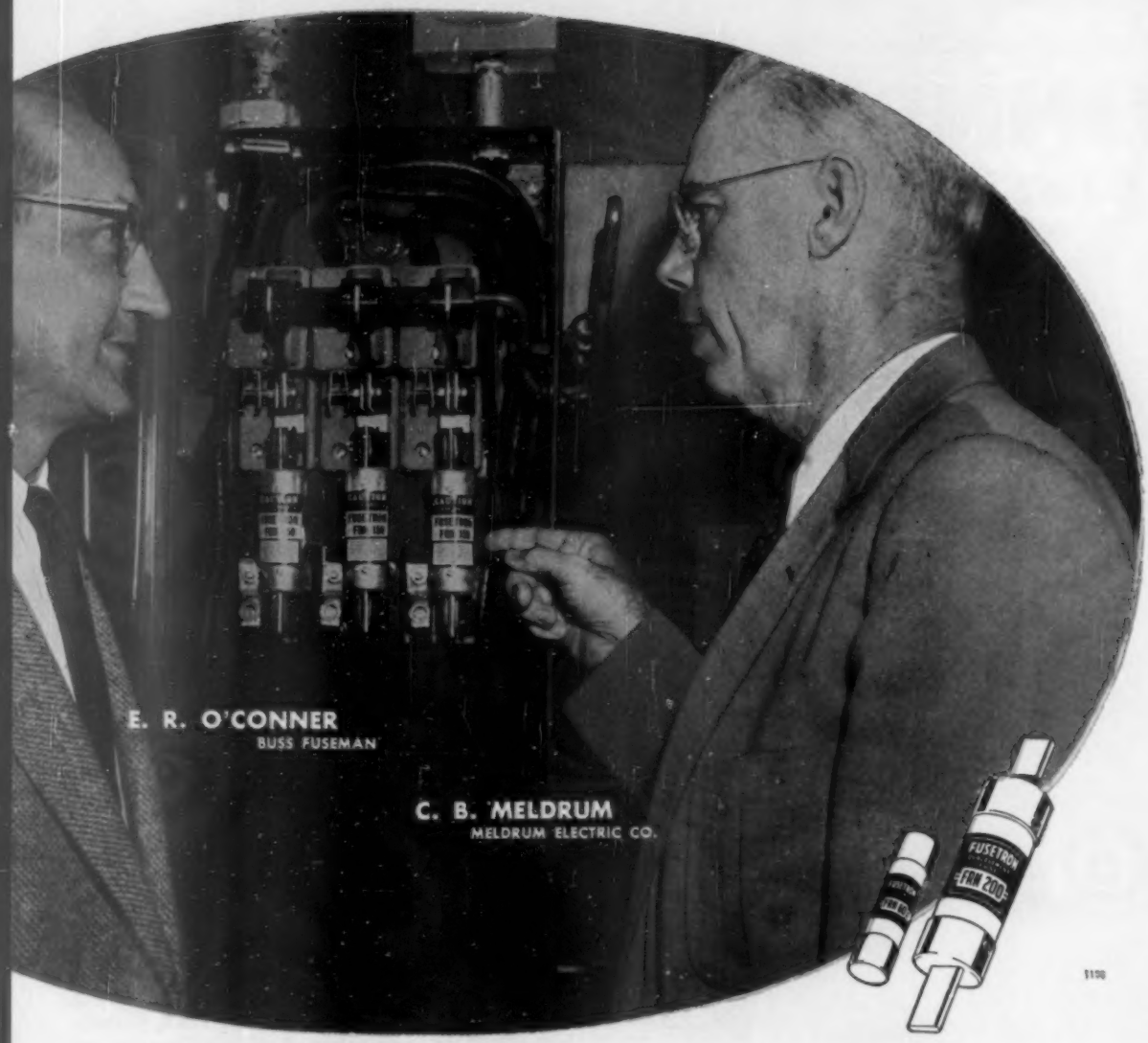
"It seems that my man who wired the 200 amp. switch failed to tighten a lug. He just hung the wire on the lug and then forgot to tighten it.

"When the unit was started, it didn't take long for trouble to develop. The loose connection caused one Fusetron fuse to blow. The motor started to run single phased but before any damage could result the other Fusetron fuses protecting the motor also blew and shut down the motor.

"My company stands behind its work. If the motor would have burned up, we would have rewound it without question. I know this would have cost us at least $200.

"What is important too, our reputation was saved and we have a satisfied customer. If the Fusetron fuses had not given us an opportunity to go back and do the job right before the motor was damaged, we would have been in a 'hot' spot."

For safe, modern, money-saving protection install FUSETRON dual-element FUSES and BUSS Hi-Cap FUSES throughout entire Electrical System!



Why Fusetron Fuses Provide Safest, Simplest Way to Prevent Damage from Single Phasing

When single phasing occurs, the current in the remaining phase increases about 100%. (Theoretically 73% but change in efficiency and power factor makes it about 100%.

This 100% overload on Fusetron fuses of motor-running protection size opens them and shuts down the motor.

Such dependable protection against motor burnouts from single phasing has never before been available.

You too, Can Get Safer, More Dependable and Money-Saving Protection with Fusetron Fuses

FUSETRON dual-element fuses provide 10 point protection against electrical troubles. This is unlike circuit breakers or ordinary fuses which, except in rare cases, protect only against short-circuits.

In Addition: Fusetron Fuses Require No Maintenance or Recalibration

They are calibrated at the factory by engineers. Once properly installed, they require no inspection or down-time necessary on mechanically operated devices. There are no hinges, pivots or contacts to stick or get out of order. Dust, corrosion or oxidation cannot increase a Fusetron fuse's capacity or lengthen its blowing time.

After years of inactivity, a Fusetron fuse will give the same safe, dependable protection if called upon to open as it would have on the day it was installed.

For Loads above 600 and up to 5,000 amps . . . Use BUSS Hi-Cap Fuses

They have an interrupting capacity sufficient to handle any fault current regardless of system growth.

They can be coordinated with Fusetron fuses on feeder and branch circuits to limit fault outages to circuit of origin.

for more information, write for . . . **Bulletin FIS on Fusetron fuses**
Bulletin HCS on BUSS Hi-Cap fuses.

BUSSMANN MFG. DIVISION - McGraw-Edison Co. *University at Jefferson, St. Louis 7, Mo.*

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS
McGRAW EDISON
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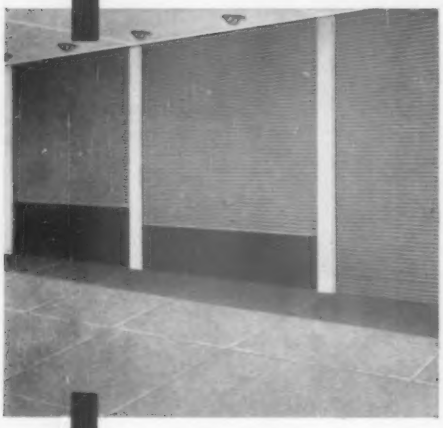
Best Answers for Doors, Passageways, Other Openings:

KINNEAR ROLLING DOORS,* FIRE DOORS, GRILLES



Coiling upward action is Kinnear's key to highest efficiency. It assures maximum space economy: *all floor and wall space around the opening is fully usable at all times.* Headroom and ceiling-space requirements are negligible (the barrel on which the closure coils when opened can in most cases be set within the wall either *below* ceiling height, *at* ceiling height, or *above* ceiling height). Motor, chain, crank or manual-lift is available, to suit any operating needs. In all cases, the closure rises completely out of the way when opened.

KINNEAR ROLLING DOORS protect openings with a continuous curtain of interlocking steel slats *(a Kinnear first)* — full door efficiency plus protection against wind, weather, intrusion, and fire.

KINNEAR ROLLING FIRE DOORS have features added to the steel-slat curtain operation that bring positive, automatic, safely controlled closure in case of fire, plus extra fire-blocking capacity approved by Underwriter's Laboratories, Inc.

KINNEAR ROLLING GRILLES, a combination of rugged steel bars and links fully protect openings against trespass, without blocking light, air, or vision.

All three of these Kinnear upward-acting closures can be used in various combinations, and are built to fit openings of almost any size. *Write today for full details.*

***Also doors of modified design, available as COUNTER SHUTTERS**

KINNEAR ROLLING DOORS
Saving Ways in Doorways

The KINNEAR Mfg. Co.
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Offices and Agents in All Principal Cities

FACTORY LETTERS

LET THE PUNISHMENT FIT . . .

Sir:

Your review is the most complimentary ever made of any of my writings ("Cost Control Through Electronic Data Processing," reviewed in August, p. 186).

Apparently, my wry—not bourbon—type of humor struck your fancy. I hope many more people will find the underlying chuckles as a result of your urging to "buy a whole bunch" for their friends.

Phil Carroll
Management Consultant
Maplewood, N. J.

► A re-reading of Phil's little book (32 pages, $1.50 from Society for Advancement of Management, 74 Fifth Ave., New York 11) discloses only straight wry. Not a single low pun of the type Phil dropped in his letter. So we don't have to retract the nice things we said; we still think it's terrific.—ED.

QUESTIONS WANTED

Sir:

Your August and September issues reported FACTORY's nationwide survey of plant maintenance and engineering practices.

In reviewing our own maintenance practices, I thought that perhaps completion of the questionnaire and comparing it with some of the data from your survey would provide a measure of our maintenance prac-

Turn the page

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NOVEMBER 1958 Vol. 116, No. 11

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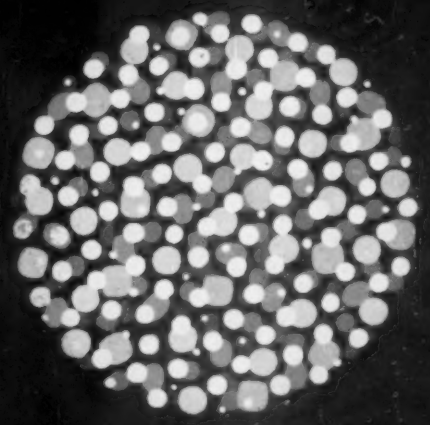
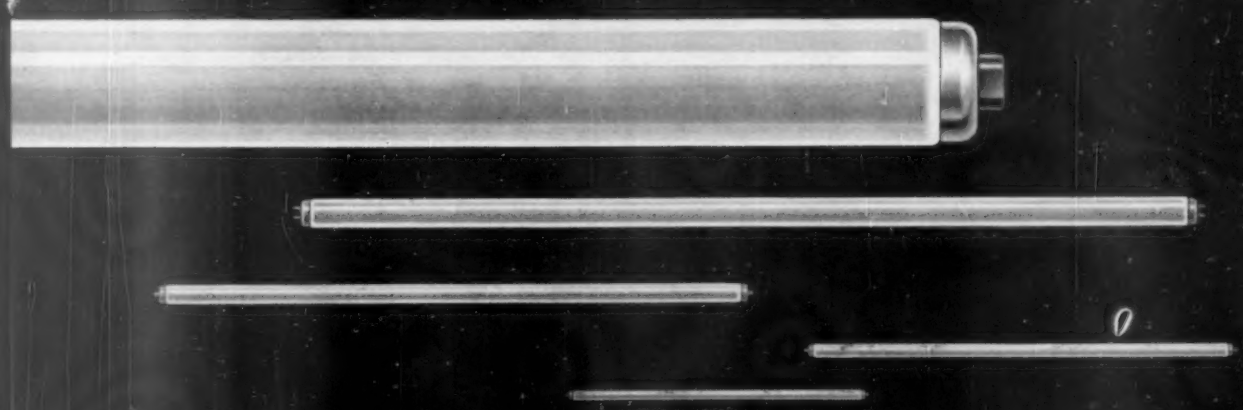
Only Sylvania's exclusive coating process homogenizes phosphors for maximum brightness





An exclusive process homogenizes Sylvania's brighter phosphors—produces today's most uniform lamp coating for today's brightest lamps

Another reason why

Sylvania Fluorescents give you more light at lower cost than all other brands

Advanced engineering makes Sylvania fluorescent lamps superior in many ways—makes light a better tool of production to increase profits

The story of phosphors is the history of chemistry in lighting. And from the beginning Sylvania has pioneered today's brighter, longer lasting fluorescent phosphors.

Year after year, Sylvania lamps have delivered more light for a far longer time than ordinary fluorescents because of their superior phosphors. In fact, only now are some other brands being introduced with the phosphor quality which Sylvania has long since improved.

One of these improvements is an exclusive coating process which uniformly distributes the phosphors throughout the tube. This unsurpassed uniformity is made possible by homogenizing the phosphors—and contributes a minimum of 3% greater brightness over other processes now in use.

This is another example of how Sylvania builds extra value into fluorescent lamps to help cut your lighting and operating costs.

Let your local Sylvania Representative show you how Sylvania's superiority can save you time and money.

Call him today or write:

SYLVANIA LIGHTING PRODUCTS
DIVISION OF SYLVANIA ELECTRIC PRODUCTS INC.
60 Boston St., Dept. 8L-3111, Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd.
P. O. Box 1190, Station "O", Montreal 9.

SYLVANIA Lighting Products

make light a better tool for profits

LIGHTING • TELEVISION • RADIO • ELECTRONICS • PHOTOGRAPHY • ATOMIC ENERGY • CHEMISTRY-METALLURGY

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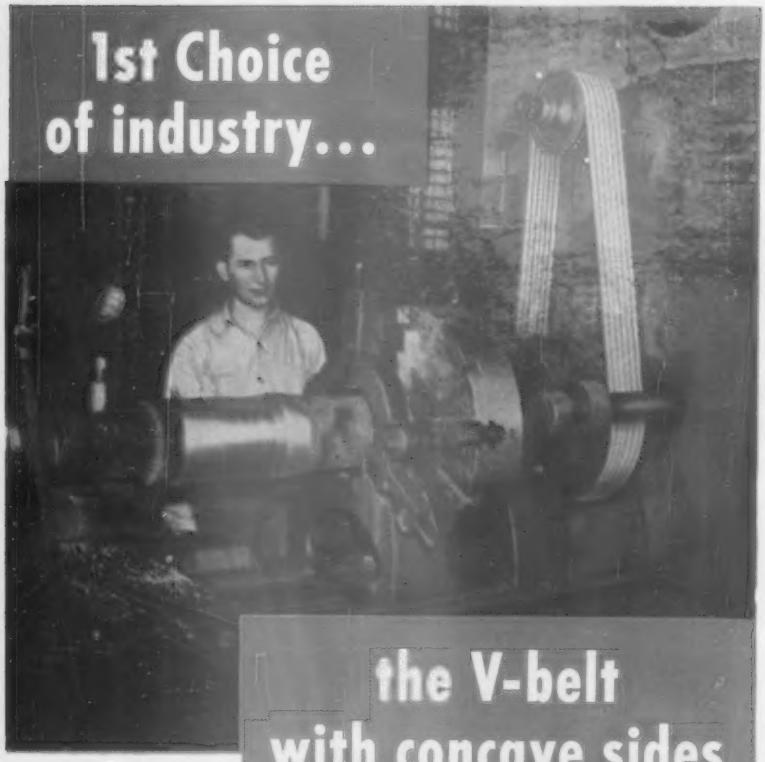
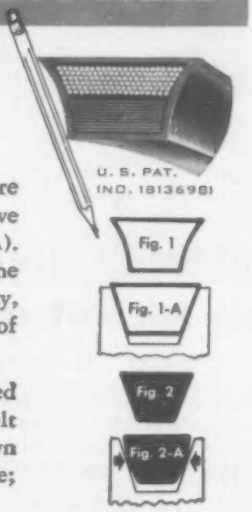


Here's why:
The Concave Sides of Gates V-Belt *insure* longer life... lower costs

Try this. Bend a Gates V-Belt as if it were going around a sheave. Feel how the concave sides (Fig. 1) *fill out*... become straight (Fig. 1A). This precise fit insures full contact with the sides of the sheave... grips the sheave evenly, distributing wear uniformly across the sides of the belt. Uniform wear lengthens belt life.

Make the same test with a straight-sided belt (Fig. 2). Feel how the sides of the bent belt *bulge out,* concentrating wear at points shown in Fig. 2A. Uneven wear shortens belt life; increases costs.



Because Gates V-Belts with Concave Sides are so universally preferred, they are also the *most widely available.* Gates V-Belts are carried by leading distributors in industrial centers throughout the world.

The Gates Rubber Company, Denver, Colorado

Gates — *World's Largest Maker of V-Belts* — TPA 342

Gates VULCO ROPE Drives

tices. Would it be possible to obtain a copy of the questionnaire that was used in getting the survey data?

Richard M. Donahue
Plant Manager
Line Material Co., Milwaukee 1

► **We still have a few blank copies of the questionnaire. No charge, but "one to a customer," please, while they last. Also, anyone interested in making this type of detailed analysis may want a copy of the complete survey tabulation. It's in duplicated form (almost 300 pages), contains many breakdowns and "cross tabulations" it was not possible to include in the published reports. Cost is $5.25. Write: Readers' Service Dept., FACTORY, 330 West 42nd St., New York 36.**

CREDIT UNIONS REPLY

Sir:

A copy of the letter you received from Mr. Jack E. Reich of the Indiana State Chamber of Commerce ("Letters," Sept. 1958, p. 10) was forwarded to me by one of our Ohio credit unions . . . It seems the letter expressing dissatisfaction with your story about credit unions was converted into a propaganda instrument and used beyond the confines of their own geographical location.

(Mr. White makes a point-by-point rebuttal to Mr. Reich. Only a small portion is reproduced here.)

The facts: The statement is correct. Credit unions pay all the taxes other corporations pay except Federal income tax . . . Congress has refused to impose the standard corporate income tax formula on credit unions. Some of the reasons:

1) Credit unions as such do not retain profits.

2) Net earnings, after meeting reserve requirements, are returned to members as cash dividends.

3) Undivided earnings, if any, and reserves do not increase the redemption value of stock (shares).

4) Shares do not appreciate in value in relation to the growth of business or its goodwill.

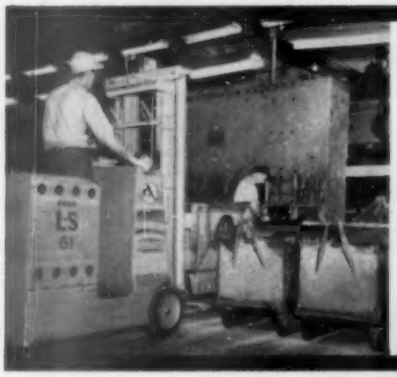
5) Credit unions do not have the power to create shares.

6) Credit union dividend pay-

Turn to page 14

Whatever you handle — do it better the L-S way...

CHEMICALS A Michigan producer of chemical products saved 35% in floor space with L-S electric trucks. Seven of their nine trucks run steady for 16 hours a day and the plant management is "highly pleased at the infrequent repairs needed."



CASTINGS A Rhode Island manufacturer switched from hand trucks and storage barrels to L-S electrics and steel drop-bottom boxes. The result? Substantial savings both in space and handling. Materials flow is faster, more dependable, less costly.

PAPER A Maine paper manufacturer reports "Lewis-Shepard electric fork trucks and tractors repaid our investment in six months. We realized a savings of over $140,000 in the first year, with the trucks operating 24 hours a day, seven days a week."

Experienced L-S representatives and the complete job-tailored line of L-S materials handling equipment can provide a better answer to any handling problem.

LEWIS-SHEPARD®

The MASTER® Line — The COMPLETE Line of Materials Handling Equipment

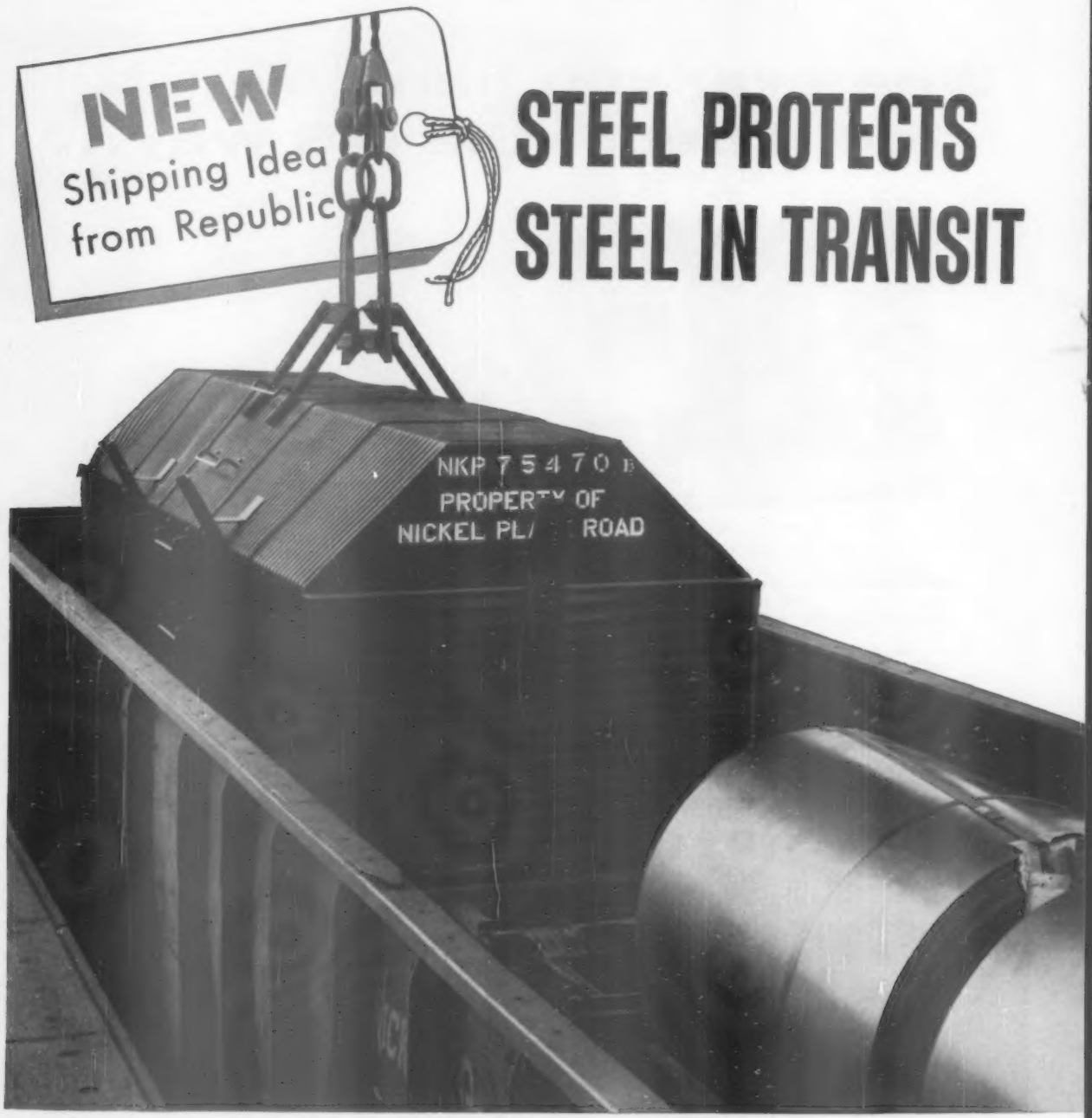
LEWIS-SHEPARD PRODUCTS, INC. • 156 Walnut Street • Watertown 72, Massachusetts

Please send me the following case histories (outlined above) showing how LEWIS-SHEPARD equipment saved dollars by the economical handling of

☐ CASTINGS ☐ CHEMICALS ☐ PAPER

NAME.....TITLE.....

COMPANY.....CITY.....ZONE....STATE.....



STEEL PROTECTS STEEL IN TRANSIT

Republic's Berger Division has developed and is producing steel gondola car covers to provide damage-free shipping of rolled steel in coils.

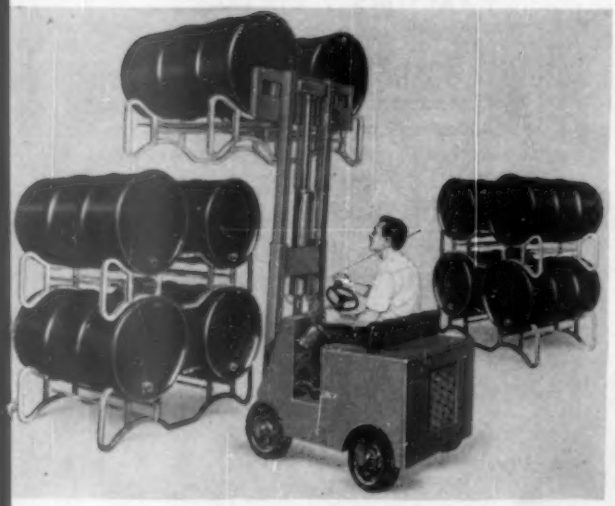
The covers afford excellent weather protection, shut out dirt, stop vandalism, eliminate costly replacement of short-lived tarpaulins. Coil users also benefit by eliminating the need for paper wrappings on coils. Another cost-saving advantage is the fact that larger coils can be shipped in specially fitted cars.

Republic Gondola Car Covers are supplied 22 feet long, 6 feet wide, and 6 feet high. Two covers are used with each 52-foot long gondola car. The covers are easily handled by overhead or trackside crane.

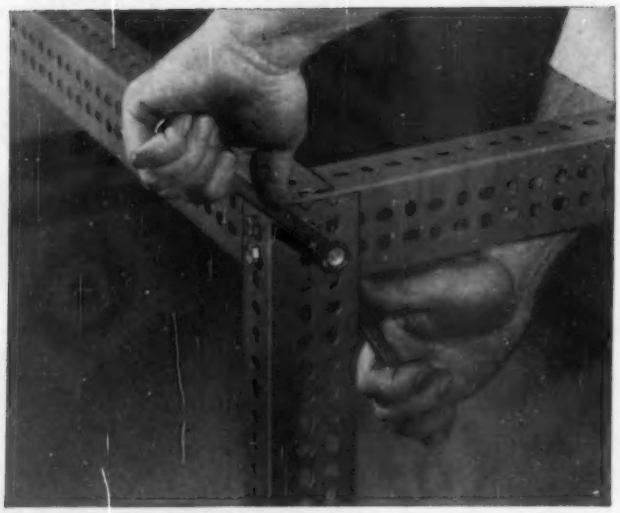
Six specially designed stacking brackets are firmly attached to each cover to permit tiering during loading or unloading operations. Corrugated steel construction of the covers provides added strength, assures long service life at lowest per-year cost.

Obtain the best possible protection for rolled steel in coils and at the same time reduce your costs. Request that your coil shipments be protected by Republic Gondola Car Covers. Mail the coupon for complete information.

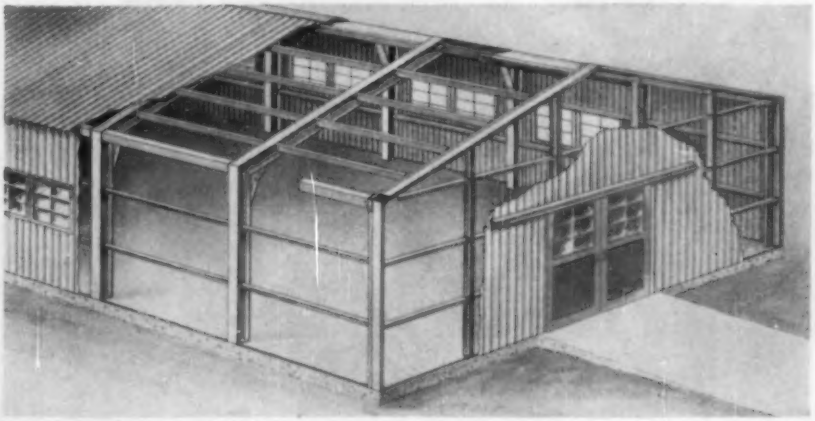
For more facts circle Reader Service Card numbers as follows:



NEW PORTABLE DRUM RACK. ANOTHER REPUBLIC EXCLUSIVE.
Now, more in-use drums can be accommodated in less floor space than ever before. These steel cradles each support two loaded 55-gallon drums, permit orderly stacking of pairs of drums to any practical height. Any standard fork-lift truck can pick up, move, and stack as many tiers of drums at one time as capacity permits. Low in cost. See your Republic materials handling equipment dealer, or send coupon.



NEW SLOTTED CONSTRUCTION ANGLE MEETS ALL YOUR FRAMING NEEDS.
It's Republic METAL LUMBER®, Republic's Berger Division's slotted construction angle. Use this versatile, durable product for racks, catwalks, scaffolds, special purpose tables and stands. Simply plan your assembly, cut it, join with bolts. Horizontal and vertical slots on ¾" centers make adjustment easy. Republic METAL LUMBER is BONDERIZED and finished with baked enamel after fabrication. Comes in convenient bundles of 10 angles, in .080 gage or .104 gage, 10- or 12-foot lengths, bolts and nuts included. Stores in same space as one 2" x 4" piece of lumber. Send the coupon for catalog loaded with ideas.



NEW COMPLETE STEEL "BUDGET BUILDINGS" are low in cost, quickly erected, reusable. These new "Budget Buildings" by Republic's Truscon Division bring the cost of additional storage space down low. Simplified design permits fast on-site erection. No painting needed. Siding, roofing, doors, windows, hardware all included. Immediate delivery in widths 32, 36, 40, 44, and 48 feet . . . 12- and 14-foot heights. Lengths as long as you want them. Send coupon for bulletin covering complete facts.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. FA-6375
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Send more information on:

☐ Gondola Car Covers
☐ Republic METAL LUMBER
☐ Portable Drum Racks
☐ Truscon "Budget Buildings"

Name _____ Title _____

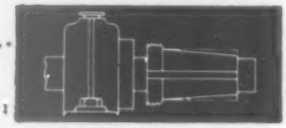
Company _____

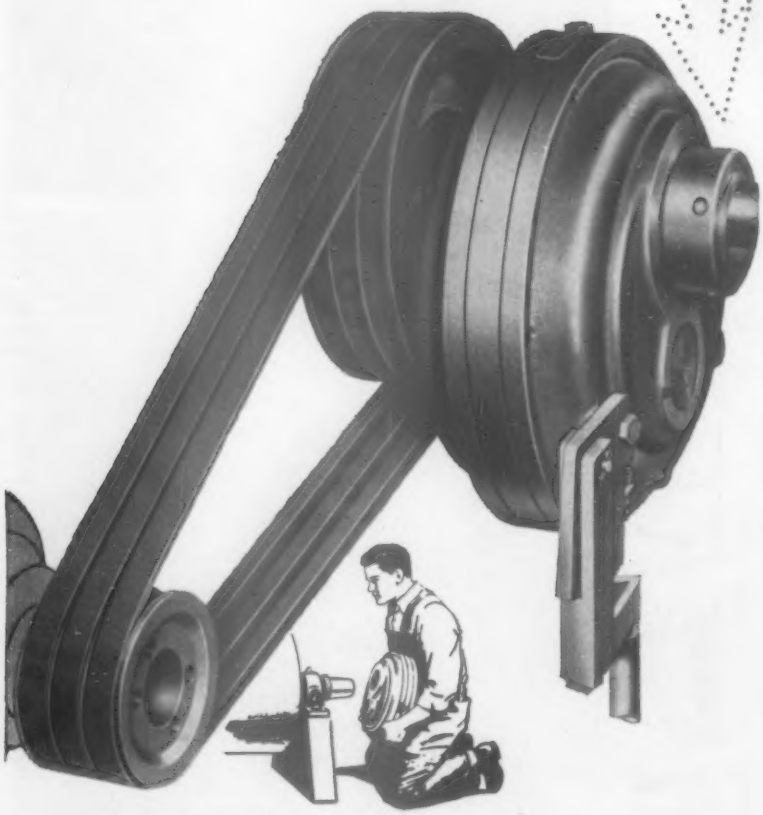
Address _____

City _____ Zone ____ State _____

457 Car Covers, 458 Metal Lumber, 459 Drum Racks, 460 Truscon Buildings.

Easy on . . .
Easy off with American's
exclusive Tapered-Hub
Shaft-King Speed-Reduction Drives





Plus FLEXIBILITY
Any speed you need . . . by sheave substitution or adjustable speed V-belt drives

Plus SAFETY
Unique overload release and either internal or external backstop . . . for extra safety

Plus ECONOMY
Modern tear-drop contour . . . saves space and eliminates clearance problem

Write for catalog: SRD-58

The American Pulley Company
Philadelphia 29, Pennsylvania
Distributors in principal cities

ments are comparable to interest on deposits paid by banks and are not considered to be dividends on stock. The banking industry does not pay Federal income tax on money paid to depositors as interest on deposits.

7) State and Federal laws limit the amount of return credit unions may receive for their services. The rate is usually lower than most commercial lenders.

8) Credit union operations are restricted to a limited group. Credit unions may not transact business with the general public.

9) The income of credit unions arises exclusively from actual transactions with, or on behalf of, its own members. . .

Finally, the Indiana State Chamber of Commerce and Mr. Reich have challenged the right of freedom of the press. How low can they stoop when they suggest McGraw-Hill promotes "socialism or worse in the banking and financial fields"? McGraw-Hill did not "fall into this kind of trap." The only thing McGraw-Hill is guilty of is factual reporting. The only thing "wrong" with what you published is that it did not please Mr. Reich and his friends.

William G. White
Director of Public Relations
Ohio Credit Union League
Columbus 8

► **Mr. White's analysis of the tax exemption—the point on which credit unions are most frequently challenged—is the best we have seen. His last paragraph is worded a bit sharply, but expresses well FACTORY's position with regard to publication of the original article ("Credit Unions Are Booming," FACTORY, Feb. 1958).—ED.**

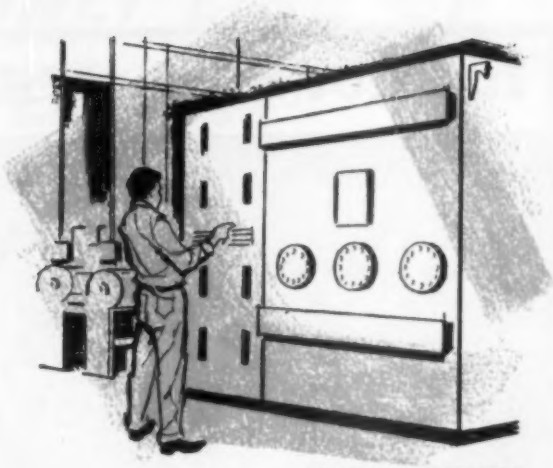
NEW PRODUCT WANTED

Sir:

We have a stacking problem which could best be solved by an outrigger or straddle type of fork truck on which the spread of the outriggers could be changed. Our pallets and skids are of varying widths and we will lose considerable rack space if we select a truck suitable for the widest pallets and skids.

Turn the page

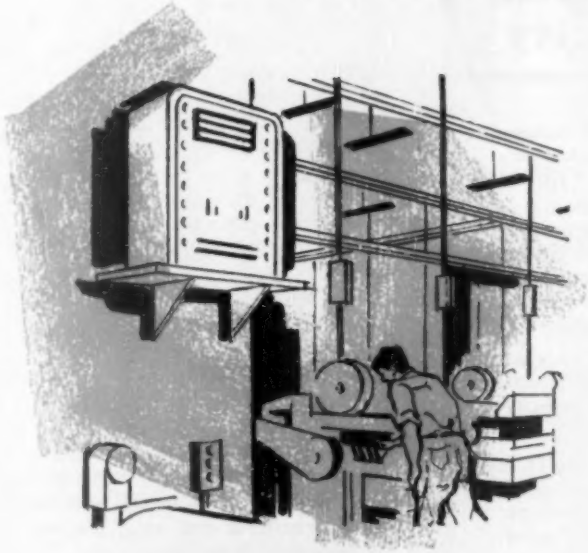
15% LIGHTER THAN
NEXT LIGHTEST TYPE



MINIMUM MAINTENANCE;
MAXIMUM RELIABILITY AND SAFETY

HERE'S WHY...

YOU SAVE BY SPECIFYING SILICONE INSULATED TRANSFORMERS



ANOTHER WAY TO SAVE
VALUABLE WORK AREA

Safer and more reliable, dry-type transformers insulated with Dow Corning Silicones frequently cost no more initially . . . and cost substantially less in the long run than liquid-filled types when savings in installation and maintenance are considered.

Easy, low-cost installation. Free of inflammable liquids and toxic fumes, silicone insulated transformers require no costly fireproof vaults, barriers, or ventilating fans. What's more, silicone insulated dry-type transformers can be located right at the load center . . . on floors, walls, or balconies . . . for added savings on costly, low voltage cable.

Less Maintenance. With no liquids to filter or change, dry-type transformers require only minimum upkeep. Silicone insulated *sealed* units are virtually maintenance free . . . require only periodic inspection of bushings, gages and transformer case.

Choose a silicone-insulated *open*-type transformer for balconies and other locations requiring minimum weight . . . a silicone insulated *sealed* unit for maximum reliability with minimum maintenance.

Greater reliability. Both sealed and open types reduce downtime by withstanding repeated overloads well above rated capacity. In addition, silicone insulation assures reliable power even when the transformer is exposed to high ambients, moisture or corrosive atmospheres.

For greatest reliability and lowest cost, it's wise to specify "Dow Corning Silicones" when you buy.

Send for your copy of a new booklet detailing the advantages of silicone insulated equipment.

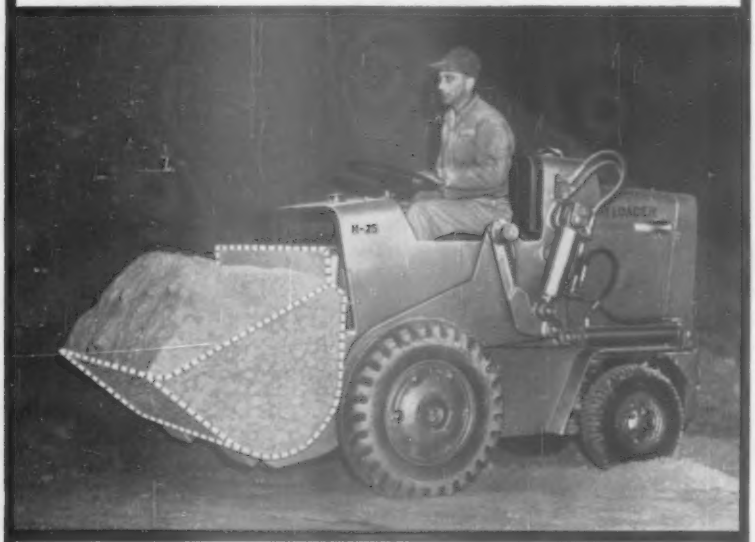
Specify
DOW CORNING SILICONES
and *Save*

first in silicones

Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.

It's not bucket SIZE...



It's the weight of the load that determines capacity

BUYING A TRACTOR-SHOVEL on a *bucket volume* basis, without knowing the unit's carry capacity in pounds puts the cart before the horse . . . you may get too much bucket (or not enough) to handle *your* material most efficiently.

Buying on the basis of *lifting capacity* is equally misleading since any unit can lift much more than it can carry. It's the pounds that can be moved safely at normal speeds, in relation to the weight of the material to be handled that determines proper bucket size.

MORE POUNDS PER LOAD—the *2500-lb. carry capacity* rating of the new model H-25 "PAYLOADER" is equal to 40% of the total machine weight. It represents *a new high* in capacity-to-weight ratio for tractor-shovels of this class.

MORE LOADS PER SHIFT— not only does the H-25 handle a bigger load for its size and weight, but it has the speed, maneuverability and ease of operation to move more loads per shift. These features make this *extra production* possible: 2-speed, full reversing power shift transmission with matching torque converter, power steer, power transfer differential, closed hydraulic system, triple air cleaners, major pivot points sealed and 40° bucket tip back.

It will pay you to have a Hough Distributor demonstrate how the H-25 "PAYLOADER" can handle more tonnage at lower cost. Ask about Hough Purchase and Lease Plans too.

THE FRANK G. HOUGH CO. 11-A-2
755 Sunnyside Ave., Libertyville, Illinois
Send complete data on the new H-25 "PAYLOADER"
Name.....
Title.....
Company.....
Street.....
City.....State.....

HOUGH
THE FRANK G. HOUGH CO.
LIBERTYVILLE, ILLINOIS
SUBSIDIARY — INTERNATIONAL HARVESTER COMPANY

FACTORY / LETTERS
Begins on page 8

We have been unable to locate such a truck through the usual channels. We would appreciate your advising us of any manufacturers offering the type of equipment described.

Frank J. Clontz
Carolina Division
Champion Paper and Fiber Co.
Canton, N. C.

► **We haven't seen the equipment Mr. Clontz wants. But it sounds as though it might have value for many plants. So we'll toss the challenge along to the truck manufacturers. Or has a reader managed an adaptation of a standard truck that fills the bill? If so, be sure to tell us about it—we'll pass the word along via the Case Book.—ED.**

ARTICLES IN BOOK FORM

Sir:

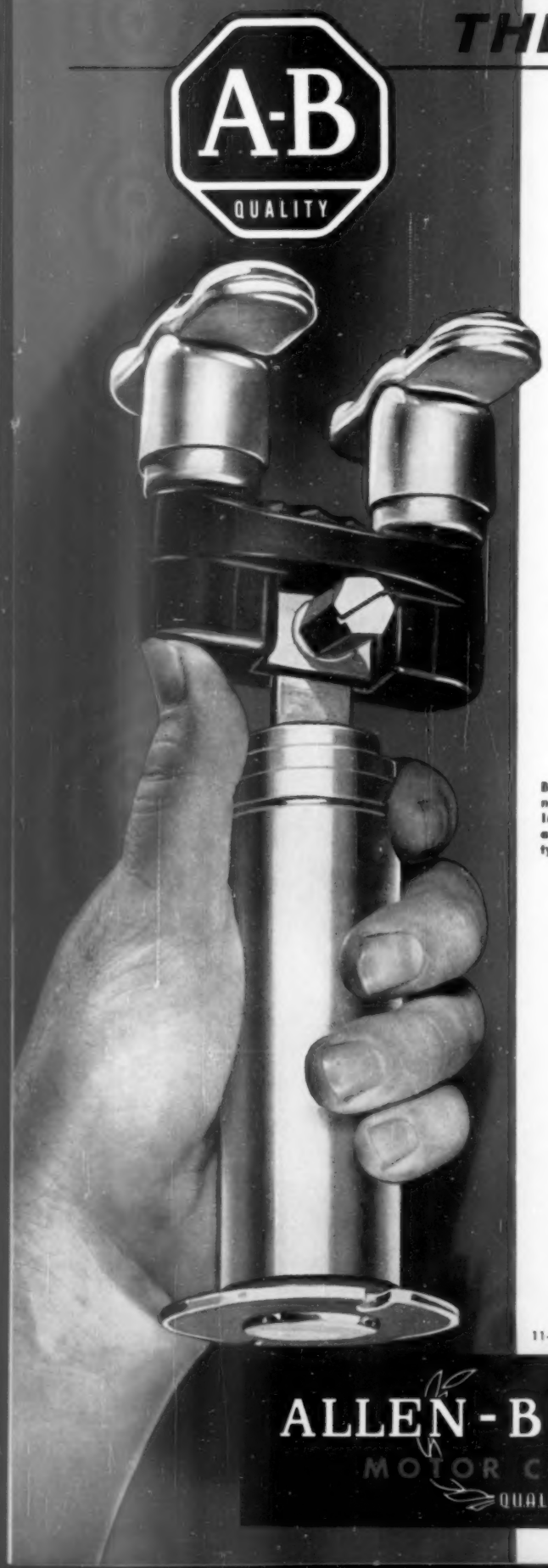
Your magazine has given me some very fine ideas . . . It occurs to me that a series of articles, directed at specific fields, bound in book form, would make a handy reference . . . I appreciate the complexity of doing such a job, also the magnitude of it; nevertheless, I feel it would be well received. . .

John A. Piper
Training Director
Wisconsin Steel Division
International Harvester Co.
Chicago

► **We have done what you suggest from time to time. But experience indicates that such special volumes rarely pay their own way. We have abandoned them reluctantly, because we share your feeling that they ought to command good readership. At present, we have two such collections in inventory: "Hitting Costs 10 Ways," and "Integrated Cost Reduction." Price is $1 each. Write: Reader Service Dept., FACTORY.**

In addition, the McGraw-Hill Book Co. has published two quite extensive collections of FACTORY articles, each selected and specially annotated by our editors: "Practical Automation" (Bittel, Melden, and Rice; $7.50), and "Materials Handling Casebook" (Urquhart and Boyce; $9.50).—ED.

For more facts circle 463 on Reader Service Card
For more facts circle 464 on Reader Service Card ➤



THE ONLY LINE OF

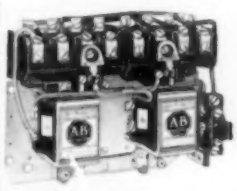
D. C.
MOTOR STARTERS
with modern
SOLENOID CONTACTORS

With Allen-Bradley, you get D. C. motor control that is *completely modern!* It uses the simplest switching mechanism yet conceived . . . the solenoid contactor with only ONE moving part. There are no bearings to stick . . . no jumpers to break. This assures millions of trouble free operations. And the double break, silver alloy contacts never need maintenance. Available in ratings up through Size 4. Write for details.

CONTACTORS

Bulletin 202 solenoid type contactor. In ratings to 150 amp. Also, clapper type to 600 amperes.

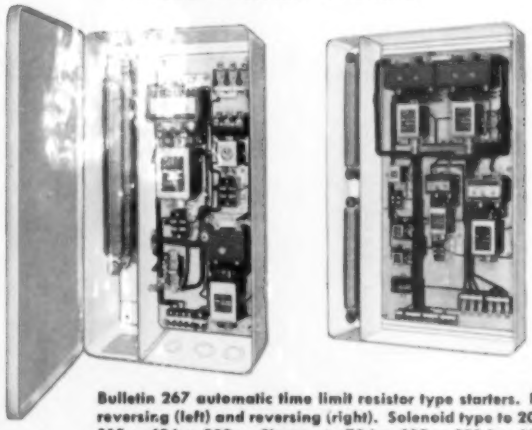
FULL VOLTAGE STARTERS



Bulletin 205 full voltage reversing starter. Ratings to 1½ hp, 115 v; 2 hp, 230 v.

Bulletin 209 full voltage starter. Available in ratings up to 1½ hp, 115 v; 2 hp, 230 v.

REDUCED VOLTAGE STARTERS



Bulletin 267 automatic time limit resistor type starters. Non-reversing (left) and reversing (right). Solenoid type to 20 hp, 115 v; 40 hp, 230 v. Clapper to 75 hp, 115 v; 150 hp, 230 v.

11-58-MR

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

MAIN OFFICE and Factory
1316 S. Second St.
Milwaukee 4, Wis.

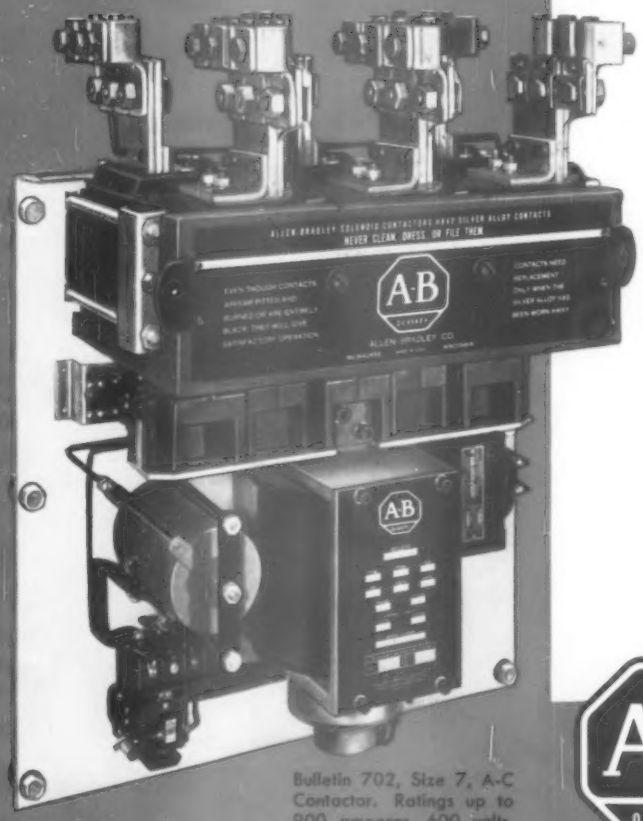
In Canada: Allen-Bradley Canada Ltd., Galt, Ontario

only

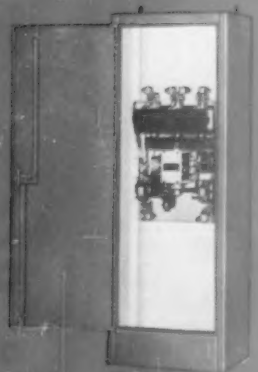
ALLEN-BRADLEY gives you Trouble Free Solenoid Starters in ALL SIZES!

The simple solenoid design—exclusive with Allen-Bradley in the big starter sizes—has only one moving part. This eliminates the trouble causing bearings and flexible jumpers of conventional clapper switches . . . and assures millions of trouble free operations. A-B solenoid starters also have double break, silver alloy contacts that never need any servicing. They are always in perfect operating condition—until the contact is completely used up.

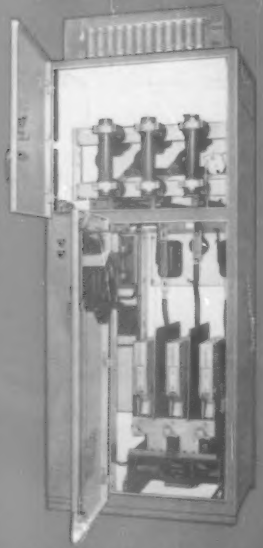
This time-tested solenoid construction is available on *all* Allen-Bradley starters up through Size 7 . . . as well as on A-B's rugged, air break, high voltage starters. Write for full information.



Bulletin 702, Size 7, A-C Contactor. Ratings up to 900 amperes, 600 volts. This basic solenoid contactor is used in large A-B low voltage starters.

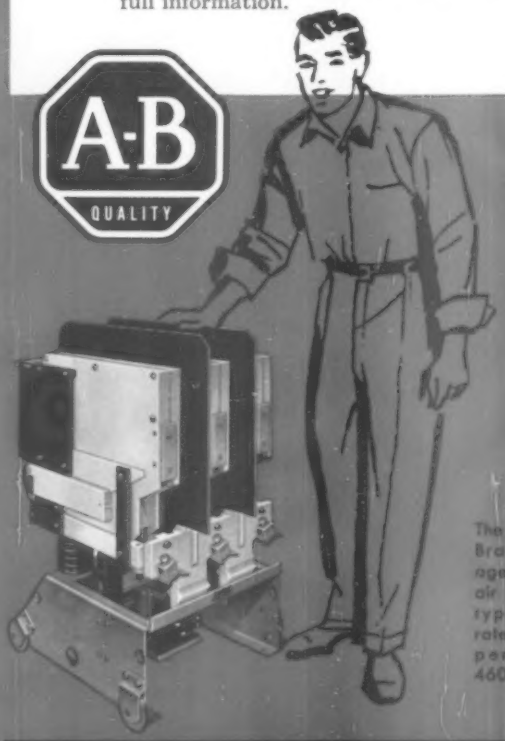


Bulletin 709 across-the-line solenoid starters are made in ratings to 300 hp, 220 v; 600 hp, 440-550 v.



A-B high voltage starters are built for all types of motors. Ratings to 1500 hp, 2300 v; 2500 hp, 4600 v.

A-B QUALITY



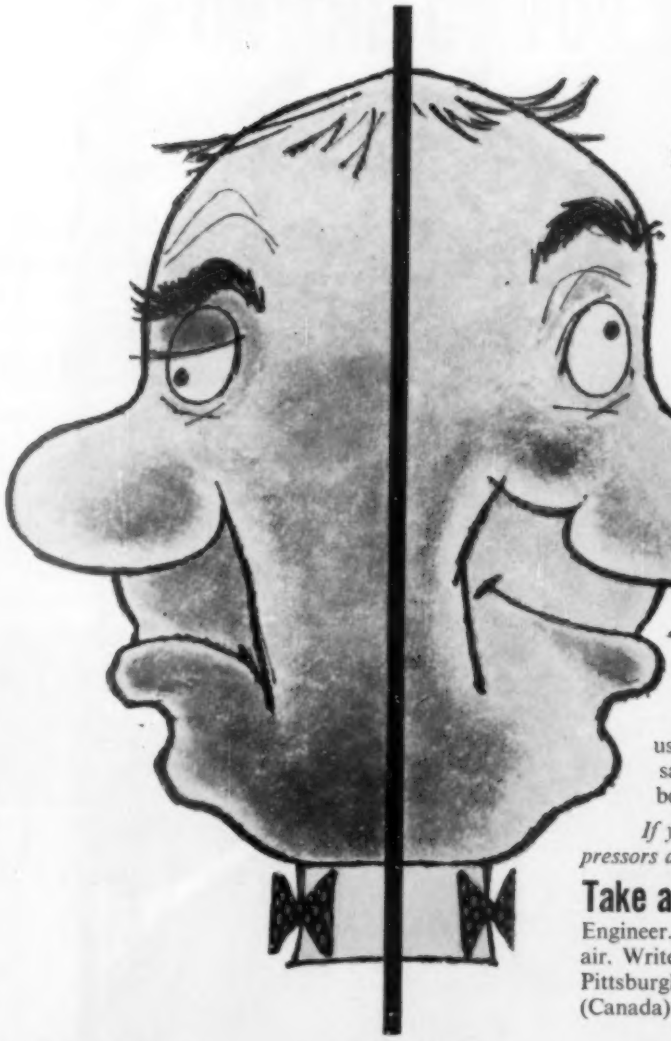
The heart of Allen-Bradley high voltage starters is this air break, solenoid type contactor—rated at 400 amperes, 2300 or 4600 volts.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

11-58-MP

let's take a second look at air compressor costs



Let's look at what Joy compressors have to offer in saving you money where it counts the most. Let's assume that all compressors are competitively priced . . . and go on from there.

eagle-eye the installation first . . . here's where specifying Joy saves a bundle. Why? Because Joy stationary compressors are "Packaged" units. They're shipped complete, ready to run without tedious, costly site assembly. Joy compressors need as little as one-half as much foundation. You can save up to $1000 on that item alone.

plus savings in maintenance . . . *All the wearing parts:* the cylinder liners, cross head guides, valves, etc., are replaceable at your plant, by your men. This is a Joy exclusive. No specialists needed, no fancy tools required. Joy engineered these compressors to run for years on minimum maintenance.

and on operation, we'll let the people who have used Joy compressors for years do our telling for us. Nope—no modesty . . . but the money they've saved in operating costs annually would sound unbelievable coming from us.

If you're frowning over the choice of your next compressors and what to do to save a needed buck . . . . . .

Take a second look and get in touch with a Joy Engineer. He'll show you how Joy saves you money on air. Write Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

WSW I 7165-243

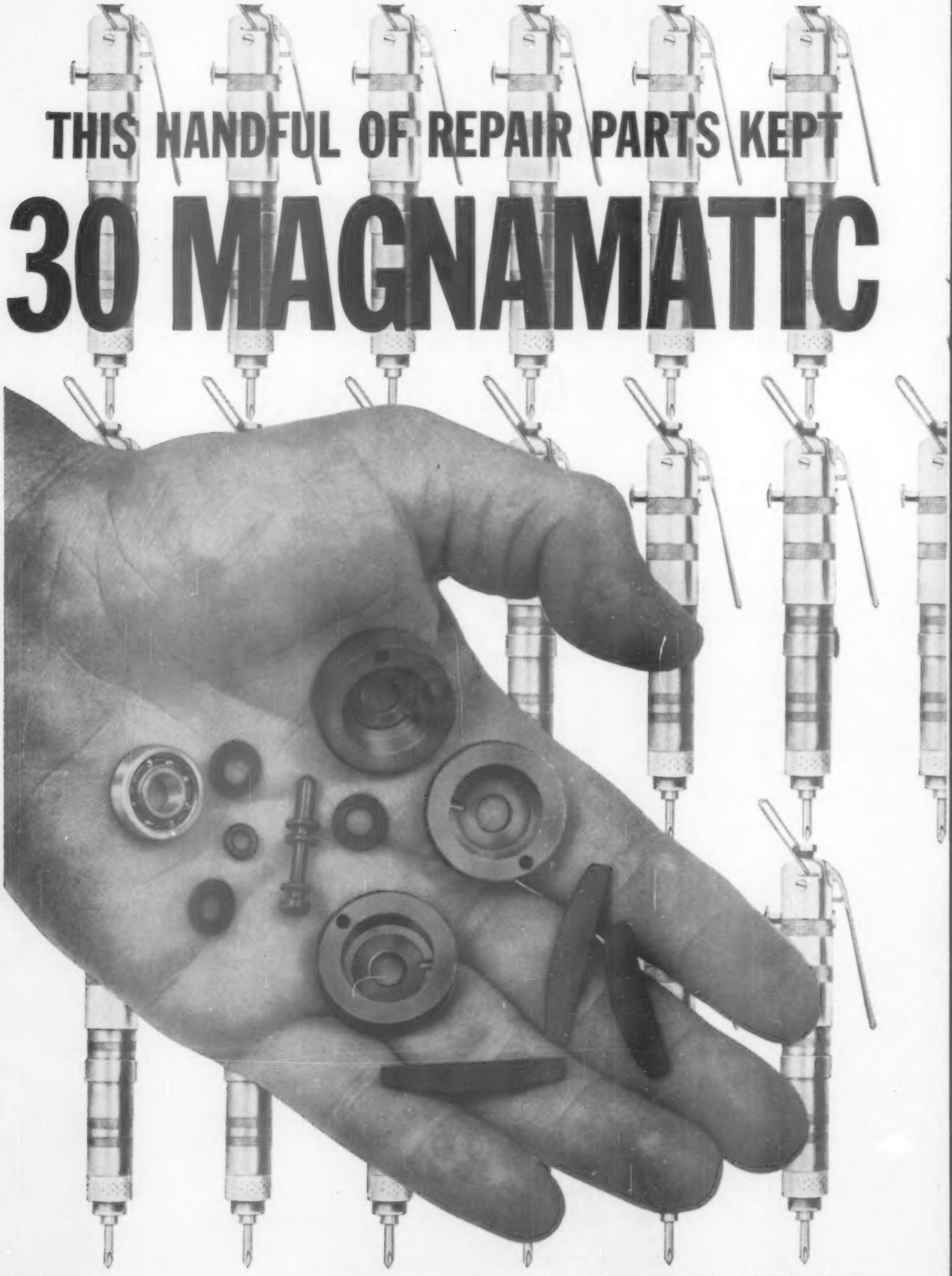
WRITE FOR FREE BULLETIN 243-12

JOY SAVES YOU MONEY ON AIR

COMPRESSORS • FANS • DUST COLLECTORS

For more facts circle 465 on Reader Service Card

THIS HANDFUL OF REPAIR PARTS KEPT 30 MAGNAMATIC



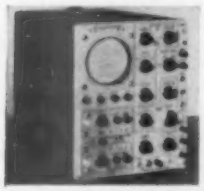
SCREWDRIVERS

ON THE GO FOR A YEAR!

Yearly maintenance records at Tektronix reveal that 30 CP Magnamatic Screwdrivers have been kept in operation at an average repair cost of only *five cents per tool per month*. A perfect combination of low cost performance and high level precision.

In one assembly operation, ceramic terminal strips are attached to the oscilloscope chassis with #2 studs and nuts ... any overdriving would shear these small studs, causing the scrapping of an expensive part. Tektronix also uses the CP Magnamatic Screwdrivers in other assembly operations where any ratcheting would slow down production.

Magnamatic's "One-Shot" Clutch runs nuts to a precise, pre-set torque—completely prevents the ratcheting and over tightening that could tie up production and pile up rejects. And the exclusive Magnamatic muffling principle keeps noise level to a *hush* and production humming even under elbow-to-elbow assembly conditions. For an on-the-spot demonstration or the complete Magnamatic story — tear out coupon and mail right now.



The Type 535 Oscilloscope is one of the precision instruments assembled with CP Magnamatics.

One-Shot Clutch "shifts to neutral" at precise torque — makes every operator an expert. Uniformity of Magnamatic's precision-tightening action is a final quality inspection in itself.

Use the coupon below for more information

Chicago Pneumatic Tool Company, Dept. M-1
8 East 44th Street, New York 17, N. Y.

- ☐ Please arrange demonstration. No obligation, of course!
- ☐ Please send me FREE booklet SP-3165 "Magnamatic Case Histories."
- ☐ Please send me FREE Bulletin 580 on "Magnamatic" units for multiple applications.

Name_____

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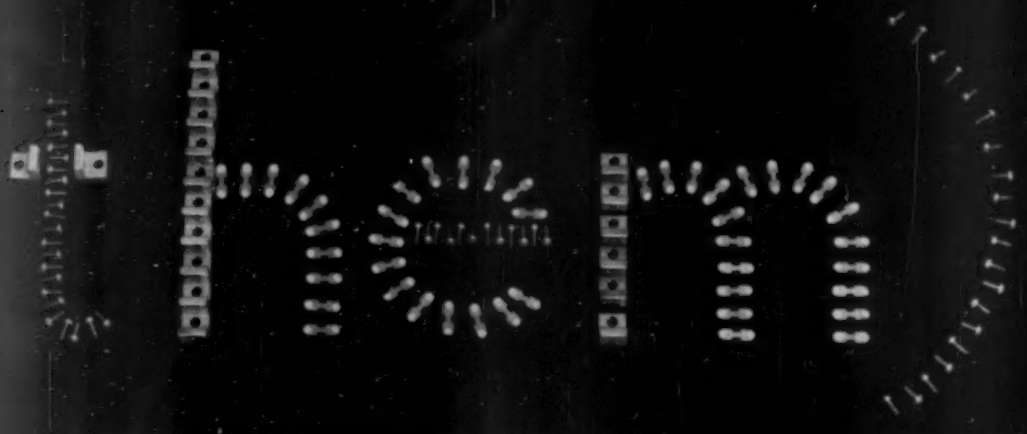
PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Here are 244 overhead crane control parts that you'll never have to buy, inventory, or replace if you have P&H electronic "stepless" crane control!

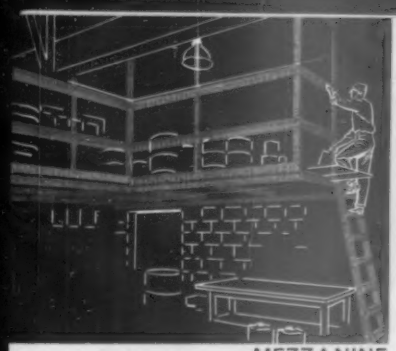


These are wearing parts from the switch gear in an AC overhead crane. They are the most frequently replaced parts on most overhead cranes. Besides their original cost, they are a source of downtime, production delay, and maintenance labor costs.

These parts have been eliminated from P&H's new Electronic "Stepless" Control and replaced with a wiring circuit requiring no maintenance.

Interested? Write Dept. 130 B, Harnischfeger Corp., Milwaukee 46, Wisconsin.

P&H HARNISCHFEGER
...quality and service for 74 years



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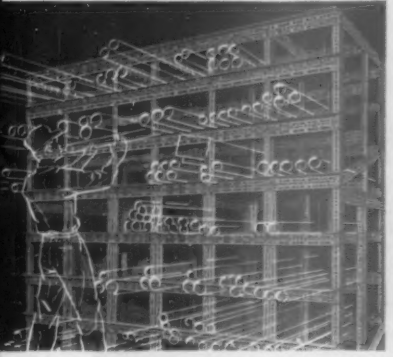
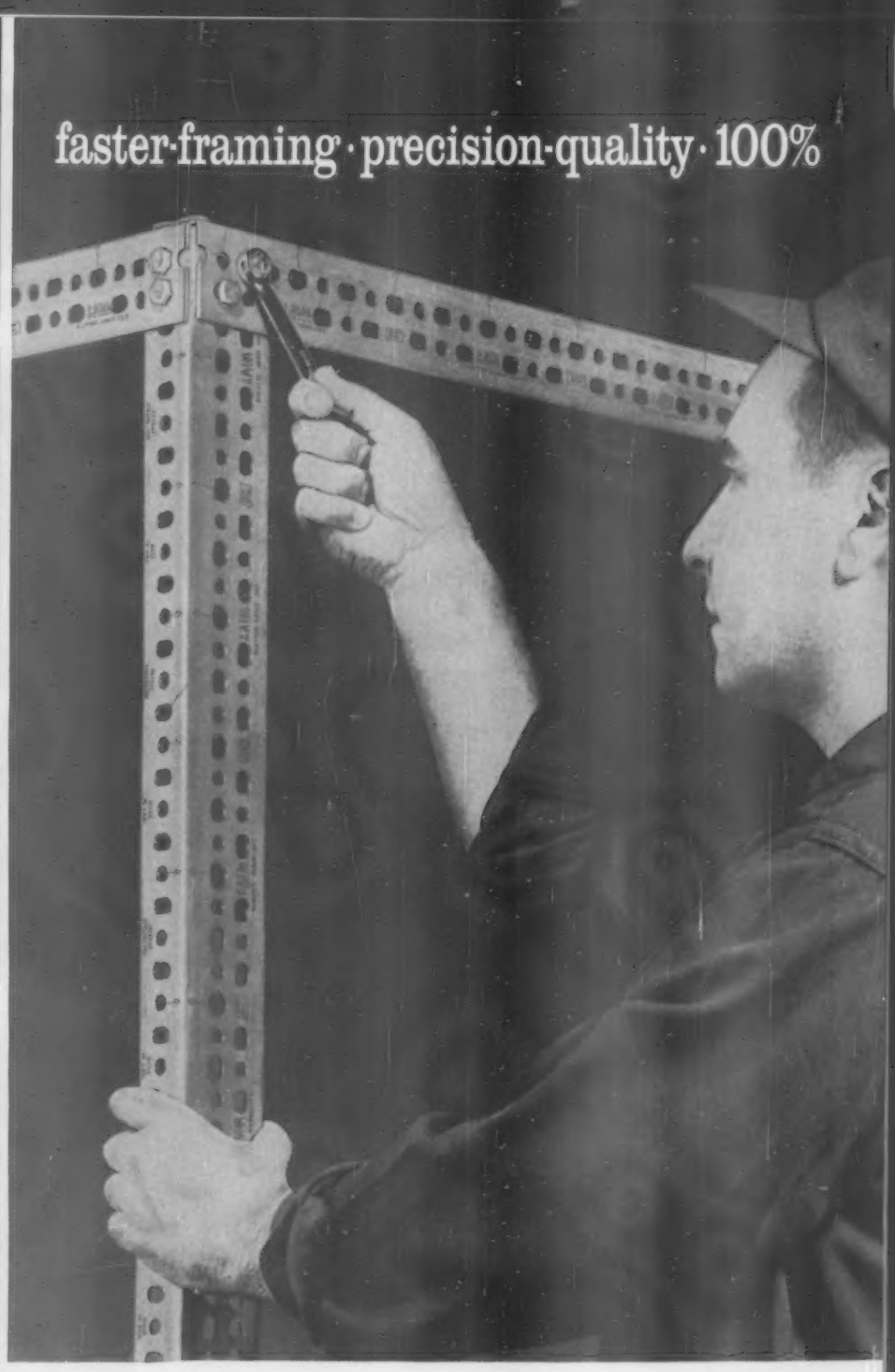
BAR STOCK RACK



faster-framing · precision-quality · 100%



Where you can get AIM Brand Slotted Angle

ALABAMA
Birmingham, Moore-Handley
Mobile, Moore-Handley

ARIZONA
Phoenix, Garrett Supply Co.
Graybar Electric Co., Inc.
Tucson, Graybar Electric Co., Inc.

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Fresno, Graybar Electric Co., Inc.
Long Beach, Graybar Electric Co., Inc.
Los Angeles, Robert H. Braun Co.
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Oakland, Graybar Electric Co., Inc.
Rialto, Robert H. Braun Co.
Sacramento, Graybar Electric Co., Inc.
San Bernardino, Graybar Electric Co., Inc.
San Diego, Robert H. Braun Co.
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San Francisco, Graybar Electric Co., Inc.
C. W. Marwedel
Santa Ana, Graybar Electric Co., Inc.

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Louisville, Neill-LaVielle Supply Co.

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Graybar Electric Co., Inc.
Cambridge, Butts and Ordway Co.
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MICHIGAN
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Benton Harbor, Industrial Equip. Supply Co.
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new

AIM®

BRAND

slotted angle

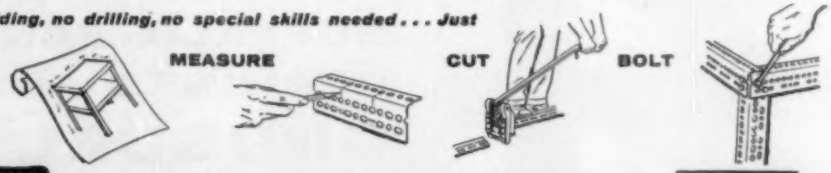
This versatile new Acme Steel framing metal brings amazing ease and economy to building durable structures and equipment. Its pattern makes it ideal. Scientifically spaced slot-and-round-hole pattern simplifies assembly. Friction-Joints can be made by bolting through slots when speed and convenience are most important. For maximum strength, bolting through round holes forms a Lock-Joint that just won't budge. Structural bolts with a 2000-pound safe load cappacity can be applied with either a hand or power wrench.

AIM Brand Slotted Angle is cold-rolled galvanized steel for dependable strength and rigidity. 10 or 12 foot lengths come in packages of 10 pieces with bolts and nuts. Available in two sizes: Standard 225-80 (2¼" x 1½" x .080") and Heavy-duty 300-104 (3" x 1½" x .104").

FREE! Get ideas from the AIM Brand Slotted Angle brochure for fixtures and equipment you can build with less material, fewer manhours. Write Dept. FAD-118, Fabricated Materials Division, Acme Steel Company, Chicago 27, Illinois.

No welding, no drilling, no special skills needed . . . Just

PLAN **MEASURE** **CUT** **BOLT**



ACME STEEL **AIM Brand Slotted Angle** AIM BRAND

MINNESOTA
Duluth, Graybar Electric Co., Inc.
Minneapolis, Graybar Electric Co., Inc.
The Satterlee Co.
St. Paul, Graybar Electric Co., Inc.
Haldeman-Homme, Inc.

MISSISSIPPI
Natchez, Weeks Supply Co.

MISSOURI
Kansas City, Graybar Electric Co., Inc.
Townley Metal & Hdw. Co.
St. Louis, Materials Handling Equip. Corp.
Mill Supply & Machinery Co.

NEW HAMPSHIRE
Manchester, Graybar Electric Co., Inc.

NEW JERSEY
Kearny, A. N. Nelson, Inc.
Morristown, Morristown Elec. Supply Co.
Newark, Graybar Electric Co., Inc.
New Brunswick, Metro Elec. Supply Co.
Trenton, Warren-Balderston Co.
Woodbridge, Hansen & Yorke Co. of N. J.

NEW YORK
Brooklyn, A. N. Nelson, Inc.
Buffalo, Beals, McCarthy & Rogers, Inc.
Garden City, Graybar Electric Co., Inc.
Long Island City, Graybar Electric Co., Inc.
New York, A. Lisa & Co., Inc.
Hansen & Yorke Co., Inc.
Rochester, Follansbee Metals Corp.
The Sidney B. Roby Co.
Schenectady, Syracuse Supply Co.
Syracuse, Syracuse Supply Co.

NORTH CAROLINA
Charlotte, Industrial & Textile Mill Sup. Co.
Greensboro, Odell Mill Supply Co.

OHIO
Akron, Graybar Electric Co., Inc.
The Hardware & Supply Co.
Chillicothe, The W. H. Kiefaber Co.
Cincinnati, Graybar Electric Co., Inc.
The Scallan Supply Co.
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Strong, Carlisle & Hammond
Columbus, The Ross-Willoughby Co.
Dayton, The W. H. Kiefaber Co.
Hamilton, The W. H. Kiefaber Co.
Massillon, The Hardware & Supply Co.
Springfield, The Ross-Willoughby Co.
Toledo, Graybar Electric Co., Inc.
The Stellhorn Co.
Youngstown, Graybar Electric Co., Inc.

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Oklahoma City, Marshal Sup. & Equip. Co.
Tulsa, Marshal Supply & Equip. Co.

OREGON
Portland, J. E. Haseltine & Co.

PENNSYLVANIA
Allentown, Wm. H. Taylor Co., Inc.
Bala Cynwyd, Material Handling Equip. Co.
Chambersburg, Tristate Elec. Supply Co., Inc.
Erie, H. P. Weller Supply Co.
Harrisburg, Raub Supply Co.
Lancaster, Raub Supply Co.
Philadelphia, Theo. C. Ulmer, Inc.
Pittsburgh, Frick & Lindsay Co.
Graybar Electric Co., Inc.
Williamsport, Raub Supply Co.

RHODE ISLAND
Providence, Graybar Electric Co., Inc.
Providence Mill Supply Co.

SOUTH CAROLINA
Charleston, Charleston Supply Co.
Greenville, Greenville Textile Sup. Co.

SOUTH DAKOTA
Sioux Falls, Graybar Electric Co., Inc.

TENNESSEE
Memphis, The Riechman Crosby Hays Co.
Nashville, Moore-Handley

TEXAS
Dallas, Towne Industrial Equipment Co., Inc.
Houston, Brents & Co.
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UTAH
Salt Lake City, Salt Lake Hdw. Co.
Graybar Electric Co., Inc.

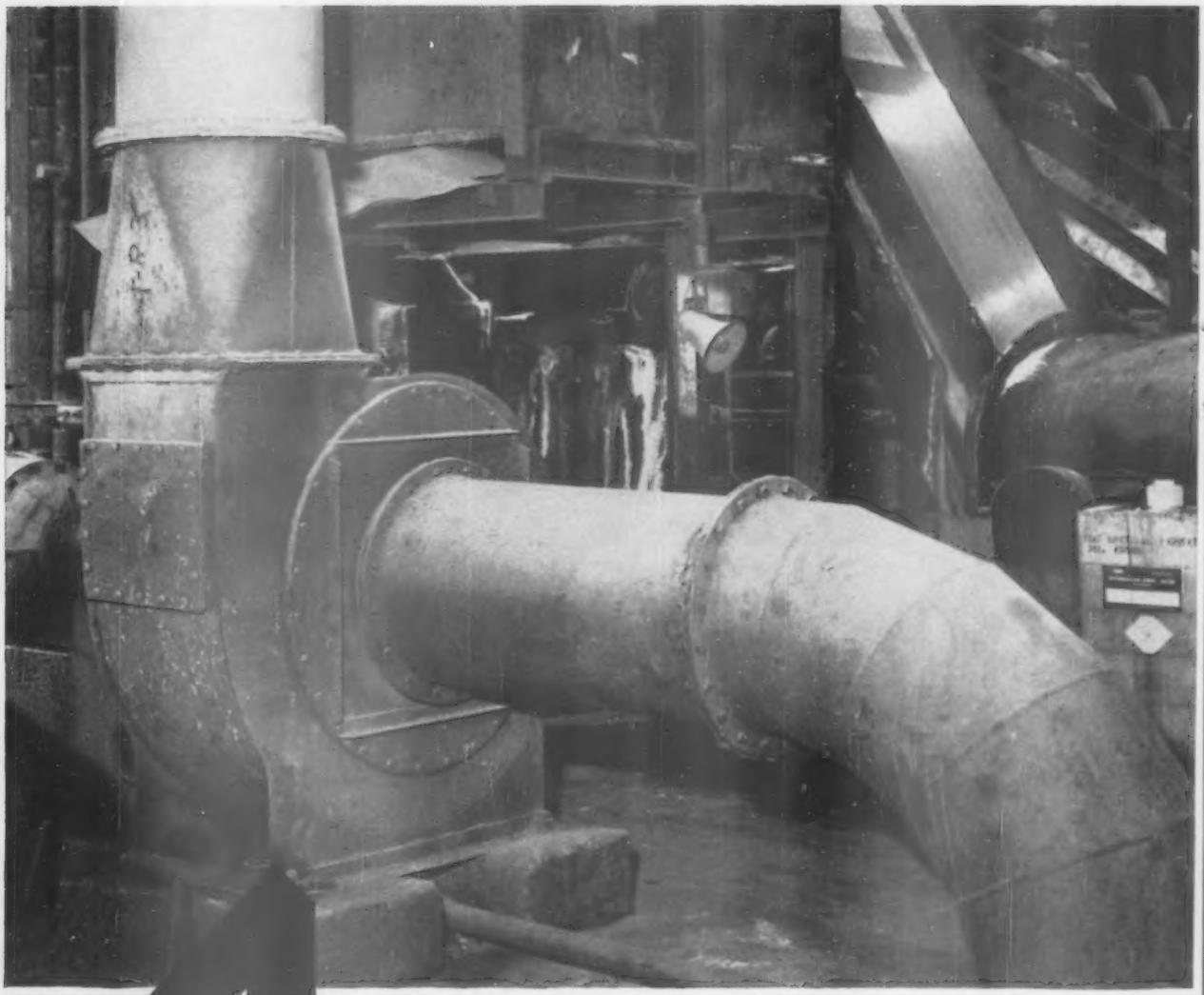
VERMONT
Rutland, Graybar Electric Co., Inc.

VIRGINIA
Harrisonburg, Tristate Elec. Supply Co., Inc.
Norfolk, Tidewater Supply Co., Inc.
Richmond, Industrial Supply Corp.
Winchester, Raub Supply Co.

WASHINGTON
Seattle, Campbell Industrial Supply Co.
Spokane, J. E. Haseltine & Co.

WEST VIRGINIA
Charleston, Graybar Electric Co., Inc.

WISCONSIN
Green Bay, W. E. Thew Supply Co.
Milwaukee, Hein Electric Supply Co.



4 "BUFFALO" FANS DESIGNED FOR UNUSUAL PLANT APPLICATIONS

Shown here are four "Buffalo" Fans specifically designed to cover a broad range of unusual industrial air or materials moving applications. If you have a unique problem not covered here, chances are your nearby "Buffalo" Engineering Representative has encountered a similar situation and can provide a practical and economical solution. He has the complete line of "Buffalo" Fans to back him up — plus more than 80 years of "Buffalo" engineering experience covering thousands of installations.

Phone your "Buffalo" Representative, or write us direct for bulletins and full information.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT

"Buffalo" Rubber-Lined Fans at left:

In handling corrosive acid fumes, users report that "Buffalo" Rubber-Lined Fans stay on the job from three to twelve times as long as ordinary fans. Every part of the fan exposed to acid fumes is covered with soft or hard rubber, as required. Actually welded into the pores of the metal, this rubber coating gives long, trouble-free fan performance under the most severe service. Write for Bulletin FI-110.

"Buffalo" Cast Iron Fans upper right:

These rugged units are built to operate under extreme corrosive conditions in the chemical process industries. Extra-heavy construction is combined with high-efficiency design, resulting in extremely low-turbulence air flow. Air is guided smoothly into the wheels through the sturdy cast iron housing and cast inlet cone. Wheels are non-overloading regardless of system pressure. Write us for full information.

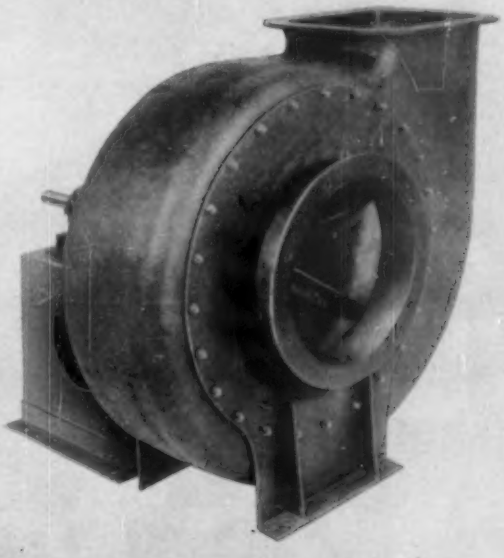
"Buffalo" Fiber Glass Fume Fans right center:

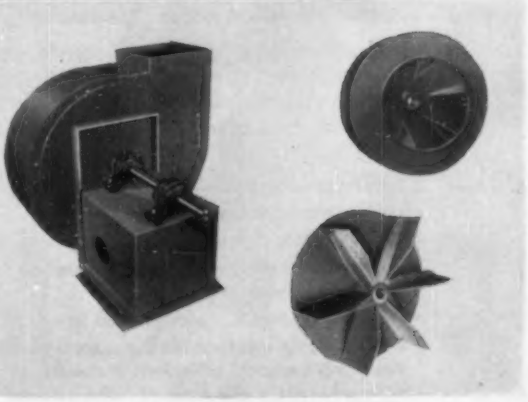
These specially-designed fans provide maximum resistance to acids, salts, gases, organic materials and other corrosive chemicals. The housing is constructed entirely of resin-bonded fiber glass. The wheel and all other metal parts in air stream are encased in thick fiber glass. This means that no metal parts are exposed to attack by corrosive fumes. Peak operating efficiency is maintained by the streamlined "Buffalo" inlet, wheel and outlet. Capacities range up to 34,000 cfm at pressures to 10″ static. Write for Bulletin FI-511.

"Buffalo" Materials Moving Fans lower right:

These heavy-duty "Buffalo" Fans are huskily built with specially-designed wheels for highly efficient handling of a wide variety of materials. The standard "MW" wheel is ideal for materials handled by a pneumatic system, such as emery dust, saw dust, chips. The open type "MW" wheel provides smooth surfaces for handling long shavings and all types of stringy material. Capacities available to 21,000 cfm. Write for Bulletin FI-110.

Every "Buffalo" Fan brings you the bonus "Q" Factor — the built-in QUALITY that provides trouble-free satisfaction and long life.





BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

Buffalo Pumps Division, Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

For more facts circle 469 on Reader Service Card

NEW WESTINGHOUSE SUPER-HI™

FLUORESCENT LAMPS GIVE 2½ TIMES THE LIGHT OF ORDINARY FLUORESCENTS

REGULAR 40-WATT FLUORESCENT LAMPS in this manufacturing area provide only 21 foot-candles of illumination on work surfaces.

NEW SUPER-HI FLUORESCENT LAMPS installed in another part of the same manufacturing section put 55 foot-candles of light directly on work areas.

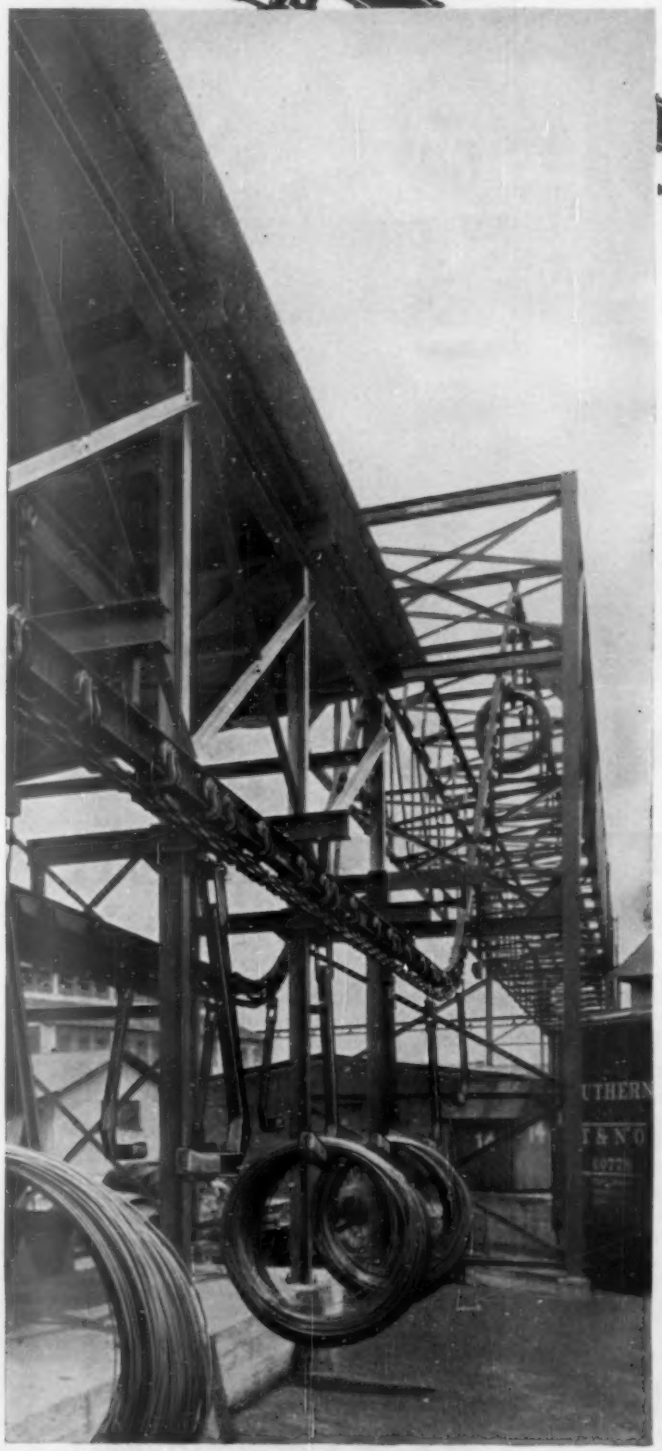
Westinghouse has developed a new Super-Hi fluorescent lamp that gives up to 2½ times as much light as regular fluorescent lamps . . . and nearly double the light of Hi-Output™ lamps. So now you can get much more light without increasing the number of fixtures. That means lower initial cost because you have fewer fixtures to buy . . . lower maintenance cost, too, because you have fewer fixtures to maintain. These powerful new lamps are ideal for medium and high bay industrial and outdoor lighting.

- ✓ **Special cooling chambers maintain proper vapor pressure to give longer life . . . more light.**
- ✓ **Longer life cathodes add to lamp life.**
- ✓ **New Chromium-Vanadium plating on lead wires retards end-darkening.**
- ✓ **Smooth slim design gives uninterrupted brightness all around the tube . . . much lighter weight for safe and easy handling.**
- ✓ **Interchangeable . . . can be used in any fixtures designed for new extra Hi-Output lamps.**
- ✓ **More reliable starting even in damp weather . . . special silicone coating over exterior surface of the lamp prevents collection of moisture.**

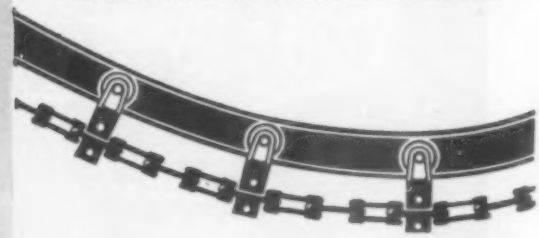
All Westinghouse fluorescent lamps have "Ultralume"™ phosphors to assure maximum brightness for the life of the lamp. There's one for every industrial, business and home use. Specify Westinghouse on every lamp order. Call your local authorized Westinghouse agent or write—Westinghouse Lamp Division, Bloomfield, N. J.

YOU CAN BE SURE...IF IT'S Westinghouse Ⓦ FLUORESCENT LAMPS

LINK-BELT Trolley Conveyors...



◀ **OBSTACLE COURSE.** Link-Belt trolley conveyor carries 600-lb. wire coils over railroad tracks and buildings to wire mill or storage. This Link-Belt system has helped make this one of the world's fastest combination mills.



hurdle obstacles to continuous production

Nothing stands in the way of straightline production with a Link-Belt trolley conveyor. Continuous handling is made feasible in otherwise impossible circumstances by bending this conveyor upward, downward or to either side. Even railroads, highways and buildings can be bridged for uninterrupted flow of material.

Link-Belt, a pioneer in the trolley conveyor field, has been responsible for many of industry's outstanding installations. And all this background—with handling products ranging from bread to bombshells—is at your command with a call to your nearest Link-Belt office. Or write for Book 2330.

14.820

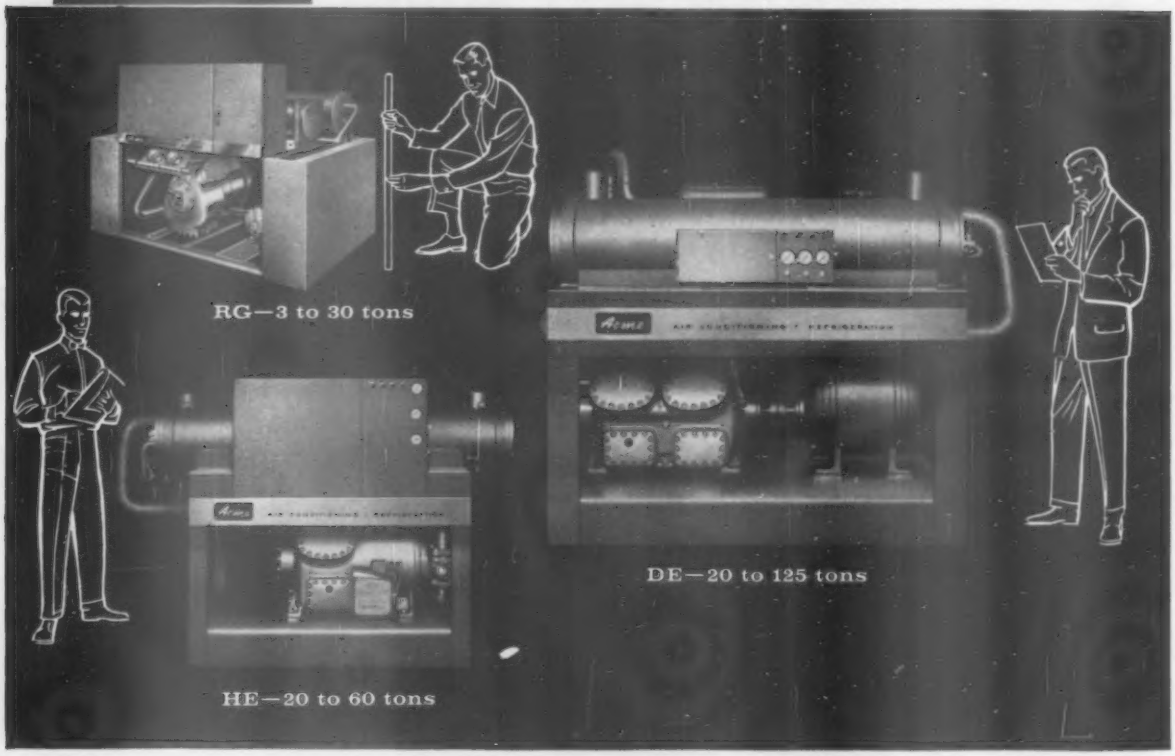
LINK-BELT BALL BEARING TROLLEY offers numerous free-wheeling features that hold down overall servicing costs... keep conveyor running smoothly . . . minimize power requirements. Available in riveted or bolted types.

LINK-BELT

TROLLEY CONVEYORS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

Acme . . . the **practical** approach to air conditioning



A full NEW line of Acme WATER CHILLERS

SMALLER • LIGHTER • EASIER TO USE

Here is a completely new line of Acme packaged water chillers, in a full range of sizes, which pack more capacity in less space than ever before. Size has been cut as much as 50%, weight as much as 30% and costs have been reduced, too.

These great new Acme packaged water chillers mean that you can save building space . . . cut structural requirements . . . slash installation costs while using top quality Acme equipment.

Complete Acme Systems

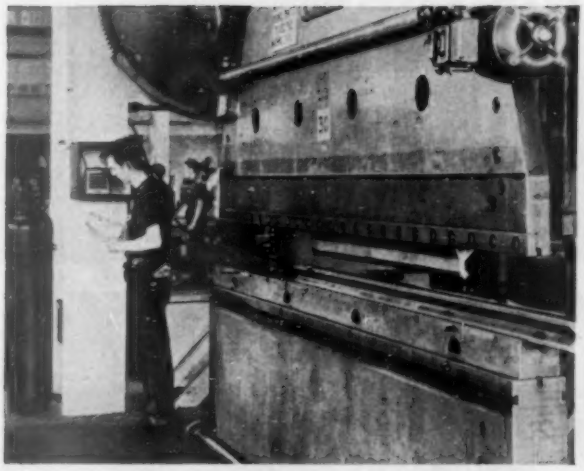
In addition to this great new line of packaged water chillers, Acme offers a complete range of water saving and cooling distribution equipment for both wet and direct expansion systems. Get the full story on the new Acme packaged Water Chiller line and on other components for a complete Acme system. Call your nearby Acme sales engineer or write directly to the factory.

Acme INDUSTRIES, INC.

JACKSON, MICHIGAN

Manufacturers of quality air conditioning and refrigeration equipment since 1919.

How Canadian General Electric Gets Up-to-the-Minute Cost Data at Less Expense!



When starting and finishing a job, employee talks into nearby Executone, reporting clock number, job, and machine numbers to centralized timekeeping office. No time is lost walking to make reports, waiting in line, visiting with friends.

When call comes in, girl records all data on pre-punched cards. Data is processed and analyzed by management within hours instead of weeks. Errors are spotted quickly, corrective action can be taken while job is still running.

Executone reduces time lag by two weeks— Savings more than pay for system!

At the Canadian General Electric plant at Guelph, Ontario, Executone Centralized Timekeeping has proved itself an invaluable management tool—

- Three girls now handle the work. Elimination of in-plant timekeeping released eight employees for other duties.
- Labor costs are compiled within 24 hours instead of two weeks.
- Employees gain productive time because less time is lost walking, waiting and visiting when making job reports.
- Down time is cut. Machine breakdown, lack of materials, etc., are reported immediately. Corrective action is taken while job *is still running.*
- CGE has gained 700 sq. ft. additional production space by eliminating Timekeeping Centers.

Executone Can Do It For You!

With Executone, data gathering becomes an easy way to obtain your labor cost information at the source and channel it directly from the factory floor to a centralized timekeeping office in a matter of *seconds.* No matter what the size of your operation, your local Executone man can help you plan a system to fit your exact requirements. For full information, send coupon below today.

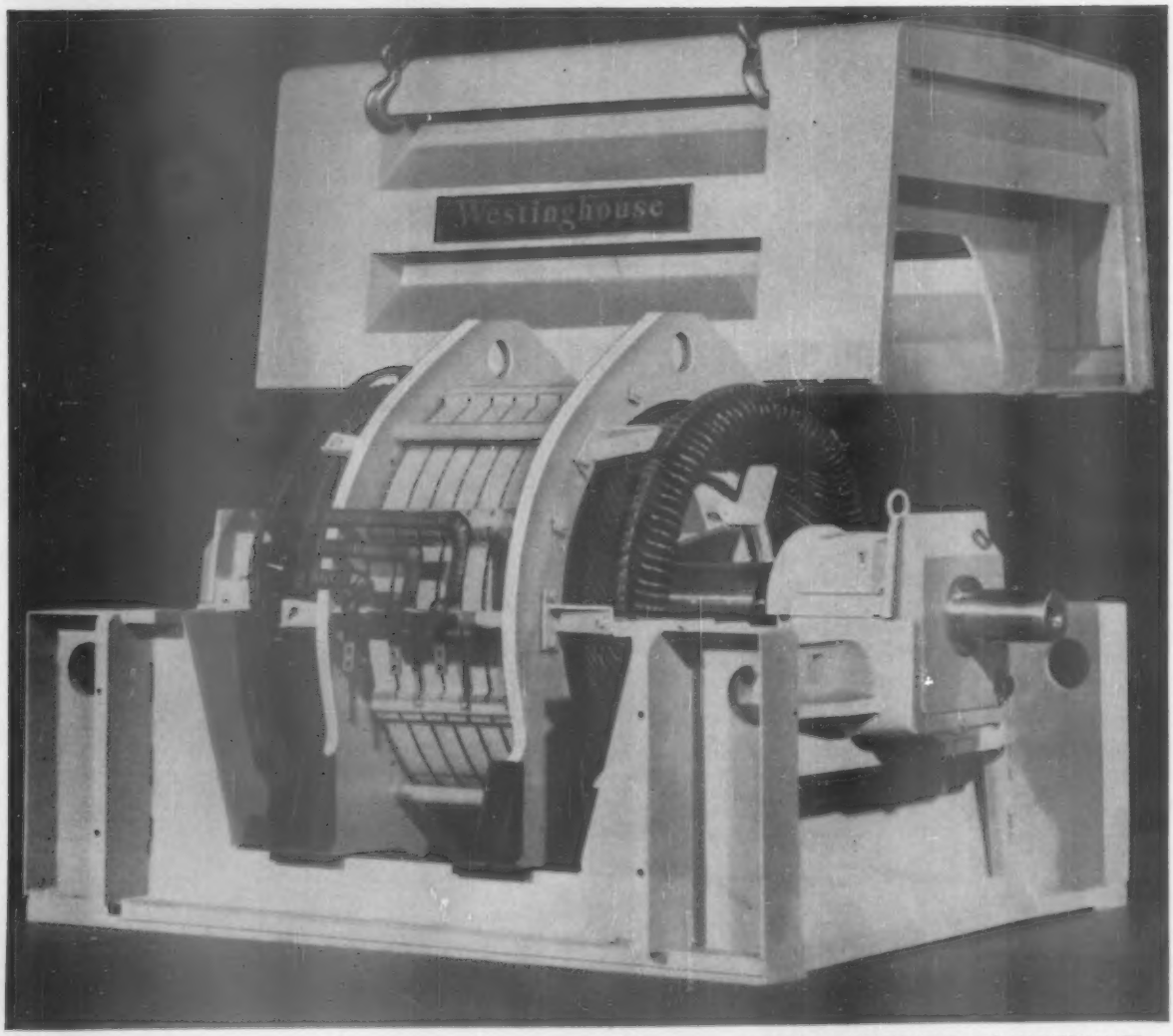
Executone, Inc., Dept. s-s, 415 Lexington Ave., N.Y. 17, N.Y.
Without obligation, please send me the following Centralized Timekeeping Information:

☐ Production Control ☐ Incentive Plan Control
☐ Cost Control ☐ Other Case Histories
☐ Name of Local Representative

Name_____
Company_____
Address_____
City_____ Zone____ State_____
In Canada—331 Bartlett Ave., Toronto

Executone
CENTRALIZED TIMEKEEPING SYSTEMS

Revolutionary new Westinghouse F/A Motor gives you five major advantages



First fully accessible motor ... takes guesswork out of inspection

For the first time in large motor history, the motor housing is completely separate from the stator, with all the benefits such construction implies.

Inspection — once a matter of partial visibility and guesswork — is now a thorough and easy operation which insures your motor investment. Advantages impossible in conventional motors are standard features of this F/A Motor design.

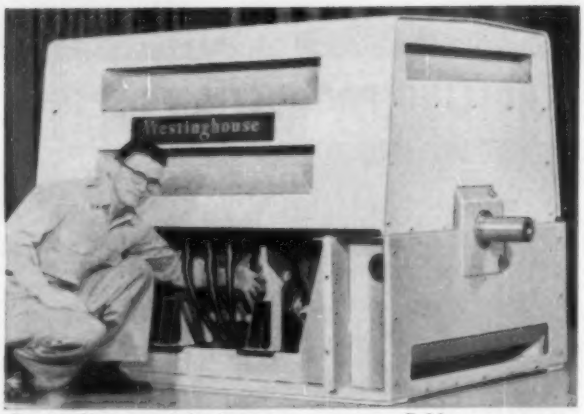
1. Full accessibility. Total inspection is possible for the first time. Enclosures are quickly removed, easily replaced. Reassembly is automatically precise.
2. Inherently quiet. Housing is isolated from the stator, reducing transmission of vibration and noise.
3. Thermalastic® insulation. Recognized as the finest available, it assures long life and protection of coils.
4. The same basic components — rotor, stator, bearings — which have made Westinghouse motors famous for long, efficient service life.
5. Easy to connect. No conduit box. Cables pass through the base bottom with extra-ample room to connect motor leads.

These and many other qualities make the new Westinghouse F/A Motor your best investment. It is presently available in large induction motors, both squirrel-cage and wound rotor. Various types of enclosures include dripproof, splashproof, weather protected, force ventilated, enclosed self-ventilated with cooler and TEFC tube type. Horsepower ratings range from 250 up to 7000, depending on speed.

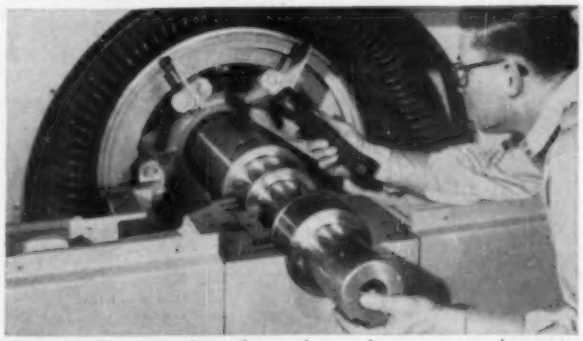
For full information, call your Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-15011

YOU CAN BE SURE...IF IT'S **Westinghouse**

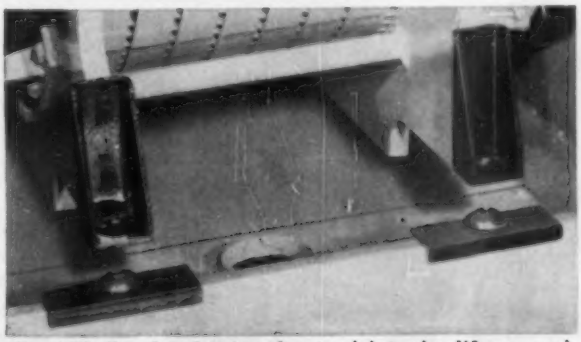


Protruding conduit boxes are gone. Cable comes up through the base, leaving plenty of room for connecting motor leads.



By merely removing the end panels, you can inspect windings and bearings.

Remove bearing cap, top bearing shell and oil ring; then the bottom bearing shell rolls out for easy inspection.



Special ball and socket type locator joints simplify removal and replacement of stator. In reassembly, perfect realignment is automatic.

ROLLING PRODUCTION DEPENDS ON ROLLER BEARINGS

2 Bower exclusives give you 2 big advantages

Hundreds of America's leading manufacturers of machine tools and other production machinery use Bower tapered and straight roller bearings as original equipment. They know they can depend on Bower bearings for peak performance . . . and they recognize the advantages of these two exclusive design features:

❶ Spher-O-Honed—no run-in . . . Roller heads are ground to operating contour that other bearings must acquire through run-in. This means they hold adjustment, give smoother performance over a longer life.

❷ Higher Flange Design cuts wear . . . provides large, two-zone contact for roller heads. This exclusive design reduces pressure on individual rollers, improves roller alignment, cuts down wear and resultant end-play. Oil groove is larger, affording positive and constant lubrication of the roller heads, reducing heat and wear. Again this means longer life.

For the long life and low maintenance that mean dollars and cents in the plant, insist on Bower roller bearings for all your replacement needs. You can get them from bearings distributors.

BOWER roller bearings

FEDERAL-MOGUL SERVICE
DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC.

SEE THE 1959 NATIONAL PLANT MAINTENANCE & ENGINEERING SHOW *and Conference*

CLEVELAND PUBLIC AUDITORIUM
JANUARY 26-29, 1959

Your top investment in plant efficiency! More than 350 leading manufacturers will show machines, equipment, and services to cut costs, improve plant operations. You'll hear and talk with outstanding experts, get hundreds of dollar-saving, method-bettering ideas — in four profit-packed, on-the-job days.

Attend the conference too. Hear top experts discuss your plant maintenance management problems. For free show registration tickets and conference information write to

Show Management, **Clapp & Poliak, Inc.,**
341 Madison Avenue, New York 17, N. Y.
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WHAT YOU'LL SEE

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Plant Furniture
Plumbing Equipment
Inventory and Work Control Systems
Safety Equipment
Plant Protection Equipment
. . . every product, process, and service your complex job involves

For more facts circle 476 on Reader Service Card

For more facts circle 477 on Reader Service Card→

Correct Lubrication in Action...

43,907 machine

In this dramatic operation, bundle of shafts, heated to nearly 1600°F., undergoes quenching bath. Action takes place at Transmission and Axle Division of Rockwell-Standard Corporation in Oshkosh, Wisconsin.

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

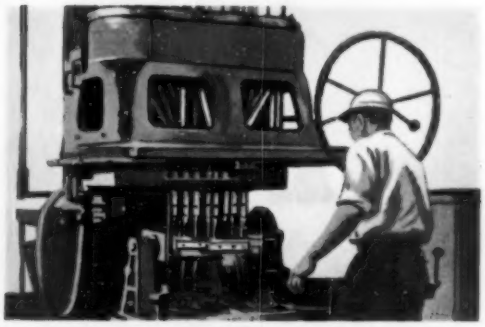
production hours saved!

In three years, Rockwell-Standard Corporation cut downtime over 36%—with the help of Mobil!

43,907 machine production hours! A worthwhile and profitable bonus. Rockwell-Standard Corporation's Transmission and Axle Division at Oshkosh, Wisconsin, made this saving through a Mobil Program of Correct Lubrication.

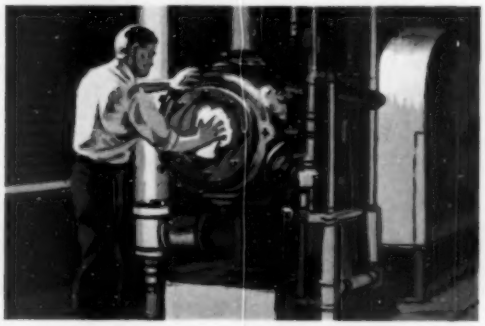
Plant maintenance engineers worked as a team with Mobil lubrication engineers. First, lubrication was put on a *scheduled* basis. This insured regular protection . . . cut thousands of repair hours. Oil contamination problems were solved . . . major repairs avoided. Mobil laboratories and Mobil specialists were called on for technical assistance.

In 1957 alone, this concentrated effort to reduce maintenance costs saved $33,063. In addition, dollars gained from increased production were many times this amount. This is *Correct Lubrication in Action!* Hundreds of plants have found it the answer to improved profits. Perhaps you will, too. Why not call a Mobil engineer and find out?

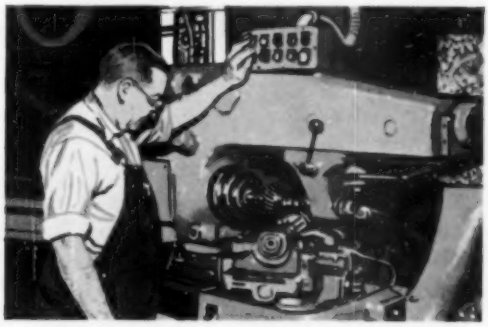


$19,520 saved on hydraulic-system maintenance. Valve failures caused severe production loss on multiple-spindle drills, boring machines and grinders. Mobil product solved problem . . . increased production by 4,000 hours per annum.

New storage and mixing tanks with automatic controls were installed as part of Mobil program. This system increased soluble-oil storage capacity . . . simplified oil purchasing . . . eliminated manual mixing of oil and water . . . saved $1,075 per year.



$3,000 air-compressor shutdown and overhaul avoided. Severe scoring was occurring in cylinder of vitally needed compressor. Mobil recommended oil that has kept compressor operating efficiently for past two years.



$27,225 saved on gear hobbers in 12-month period. Mobil and Rockwell-Standard personnel solved pump and fluid motor failures. New maintenance system reduced oil contamination, increased pump-motor life 400%.

Correct Lubrication

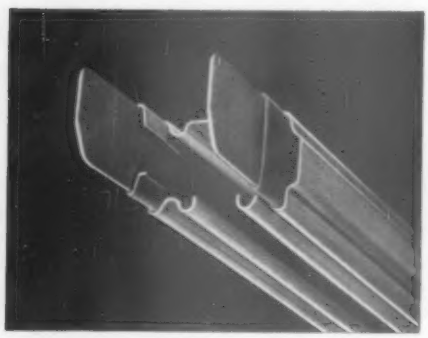
Another reason You're Miles Ahead with Mobil!

New Universal Lighting System—

for flexible, low-cost lighting

Here's efficiency and economy, too. BullDog's new 20-amp Universal Lighting System both feeds and supports lighting fixtures . . . requires no supplementary fusing. Fixtures can be positioned at any spot throughout the entire system . . . are quickly and easily moved to meet changes in lighting requirements. No rewiring or electrical downtime, either.

Listed by Underwriters' Laboratories, this new Universal Lighting System assures maximum flexibility at minimum cost. Check its many advantages. Consult your electrical contractor or BullDog field engineer. Or write BullDog Electric Products Co., Detroit 32, Michigan. © BEPCO



CROSS SECTION of new, low-cost 20-amp Universal Lighting System. Movable weight supports and twistout plugs speed rearrangement, addition or removal of fixtures, eliminate rewiring and electrical downtime.

BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

HEAT BETTER ELECTRICALLY

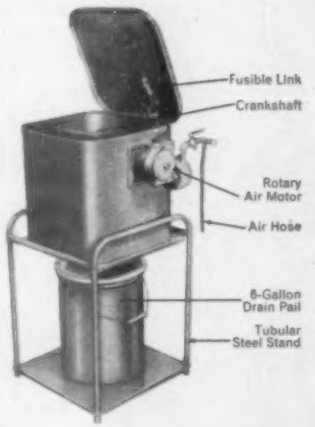
FLAMMABLES ENGINEERING BY PROTECTOSEAL

FLAMMABLES CONTROL METHODS AND PRACTICES IN PRODUCTION, PROCESSING AND IN MAINTENANCE

WHAT'S NEW...

PROTECTOSEAL AUTOMATIC WASHER FOR PAINT MASKS AND STENCILS

The Protectoseal Catalog No. 761 Washer automatically cleans paint-clogged spray masks and stencils while operator continues production work . . . requires no attention during washing cycle. Spray masks and stencils are secured to motor driven crankshaft which rotates them through solvent to provide thorough cleaning action. Spray masks are always clean and ready for instant use. No production part spoilage or lost time due to dirty, distorted masks. Washing principle operates on any compressed air supply . . . unit takes only 2¼ sq. ft. floor space.



For Further Information Circle Item 21 on Coupon

Flammables Storage Cabinet earns 3 more approvals

The Protectoseal Flammable Liquids Safety Storage Cabinet, designed to meet the specifications of the N.F.P.A. for on-the-job storing of up to 45-gallons* of flammables, has recently been approved by 3 more official agencies: National Fire Protection Association; Board of Standards and Appeals for the City of New York; and the Pennsylvania State Police, Bureau of Fire Protection. These time-saving cabinets will now carry all 3 approval labels on the front doors.

*When stored in approved safety containers of not more than 5-gallons capacity each.

For Further Information Circle Item 11 on Coupon

Speeds screw machine output at Pyle National

Placed conveniently near the screw machines at the Pyle National Company plant in Chicago, Protectoseal *Air-Matic Parts Washers* clean parts after machining to remove chips, cutting oil and grease while the operator continues his work without loss of time.

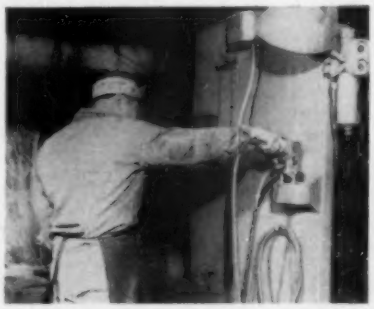
Operated by a simple, effective air motor, a metal parts basket in the tank is moved through the cleaning solvent with a minimum amount of turbulence to reduce solvent evaporation yet provide an effective cleaning motion. A reciprocating compressed air motor is employed, rather than an electric motor, to avoid the possibility of sparks. A fusible link assembly automatically closes the tank cover in the event of fire.

For Further Information Circle Item 20 on Coupon

Prevent spray gun clogging—cut lost production time

The Protectoseal *Self-Cleaning Spray Gun Holder*, in use for more than five months in the finishing department of an automotive manufacturer, has saved, "four hours spray gun cleaning time daily."

The unit is designed to keep only the nozzle-tip of a paint spray gun immersed in solvent when the gun is not in use, to prevent paint from hardening



at this point. It is not necessary to remove paint and air hoses. The unit is small, compact, and may be mounted in spray booths at the correct working level.

For Further Information Circle Item 22 on Coupon

DATA OF INTEREST AND VALUE TO PLANT MANAGEMENT

THE FAMILY OF PROTECTOSEAL CONTAINERS FOR STORAGE AND DISPENSING

☐ Complete Catalog of Protectoseal Safety Production Equipment

More Information on Items Circled Below:

11 20 21 22

THE PROTECTOSEAL COMPANY
1962 SOUTH WESTERN AVENUE
CHICAGO 8, ILLINOIS

Name_____

Title_____

Company Name_____

Address_____ City & State_____

For more facts circle 479 on Reader Service Card

Never a doubt about "GOING UP"

Otis

ENGINEERED SERVICE
BY THE MAKER

freight elevator

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N. Y.

2,000 ft. with 144,000 lbs. of starch

A. E. STALEY, JR.
President

A. E. STALEY MFG. CO.
Decatur, Illinois

Otis Maintenance keeps this "Single Trip" capacity of 20 Otis Freight Elevators constantly at work

"We do a tremendous starch processing job here at Decatur," says A. E. STALEY, Jr. "Our yearly output is valued at many millions of dollars. We're constantly moving tons and tons of material through more than 100 buildings. To do this we have 20 OTIS Freight Elevators that can lift as many as 1,440 of our 100 lb. starch bags to a combined height of 2,000 feet—all at once!

"Our concern is the uninterrupted operation of our 20 freight elevators. This is where we depend upon OTIS to give us the big lift OTIS is famed for. Our standardization on OTIS Elevators permits OTIS to assume full responsibility. It also simplifies overall maintenance. A tightly coordinated plan has been engineered to replace all wearing parts before their breakdown point. All operating and safety features are continually tested and adjusted.

"When it is realized that our 20 OTIS Freight Elevators have given an aggregate of 560 years' service and are still running like new, we feel that it isn't necessary to comment further on the quality—or *the fair cost*—of OTIS Maintenance."

ONLY OTIS MAINTENANCE OFFERS THESE ☑ ADVANTAGES TO OWNERS OF OTIS FREIGHT ELEVATORS

- ☑ **"Engineered Service" by the maker maintains the original efficiency of the installation and assures peak performance at all times.**
- ☑ **Services of factory-and-field trained men with a knowledge of elevatoring that can't be matched.**
- ☑ **Availability of original or improved replacement parts for every installation, regardless of its age.**
- ☑ **Freedom from unexpected, expensive repair bills. There's just one fixed monthly charge. It can be budgeted. It's adjusted annually, up or down, on labor and material costs only. Never because of the age or condition of the equipment.**
- ☑ **Guarantee of the maker's high standards of safety through the constant checking and replacing of parts in advance of their breakdown point.**
- ☑ **Elimination of all guesswork in testing and repairing by using specially designed tools and electronic equipment to minimize shutdowns.**
- ☑ **Systematic upkeep and replacement of parts extend the life of an installation indefinitely.**
- ☑ **The value of a maker's pride. A perfectly performing Otis installation is Otis' best salesman. That's why we're never satisfied with anything less than peak performance at all times.**

maintenance that keeps freight elevators running like new

OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

Maintain constant visual control of critical manufacturing processes...

with sharp, clear
Philco Industrial TV Systems

HERE is a new dimension in plant automation and supervisory process control. See where you can't be . . . every critical area . . . from a single, central control point.

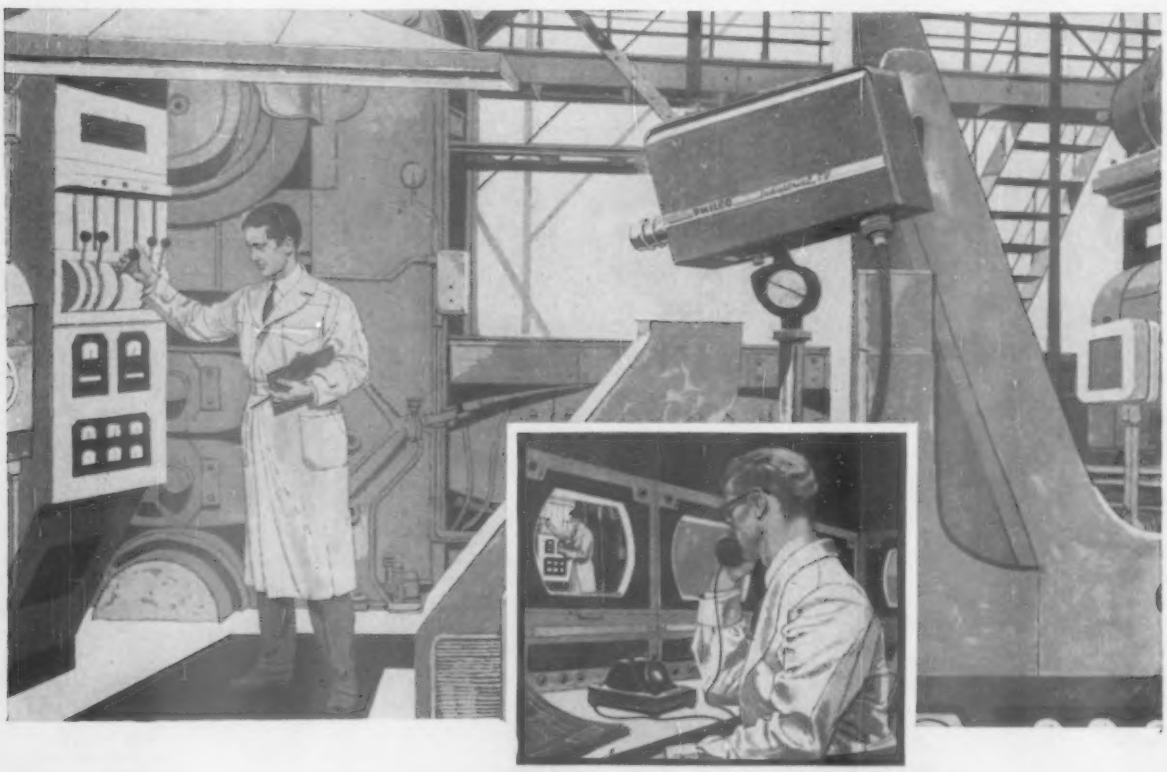
With a new, high-definition Philco ITV system you can maintain constant visual control over materials in-process, hot rolling and forming, chemical and catalyst flow, batching and mixing operations, positioning of materials and assemblies in process, crushing and grinding operations and all other manufacturing operations.

Philco's picture brilliance is unsurpassed. Details are sharp and clear. You can actually read gauges and dials at light levels as low as 10 foot candles.

Philco's complete line of ITV accessories extends the use of your basic system and permits maximum flexibility. Remote pan and tilt . . . remote iris and focus . . . Auto-Zoom lenses . . . lens turrets . . . weatherproof housings . . . explosion resistant housings . . . all assure complete versatility and adaptability to any installation through Philco's "building block" techniques.

For economical and efficient remote visual control . . . specify Philco ITV Systems. Send for illustrated brochure, describing complete Philco ITV equipment and systems.

At Philco, opportunities are unlimited in electronics and mechanical research and engineering.



PHILCO®

GOVERNMENT & INDUSTRIAL DIVISION

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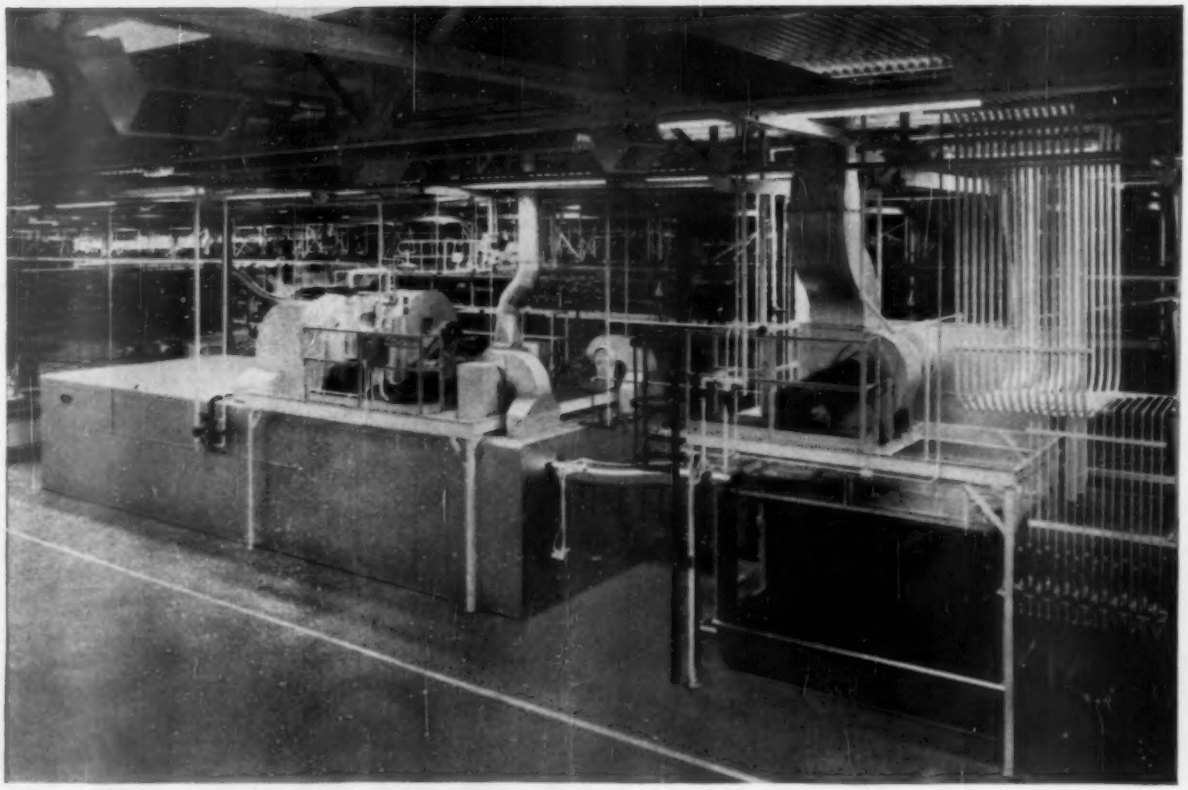
FINISHING SYSTEMS...



for Miscellaneous Parts in Various Colors!

The Spray Booth and Finish Baking Oven illustrated above handle the Finishing Operations on a group of small parts . . . this equipment is part of a large Mahon installation that provides cleaning, rust proofing, painting and finish baking facilities for all items produced in a large automobile parts plant.

If you have a finishing problem, or are contemplating new finishing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which is so important in the specially designed equipment of a modern, properly coordinated production finishing system.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

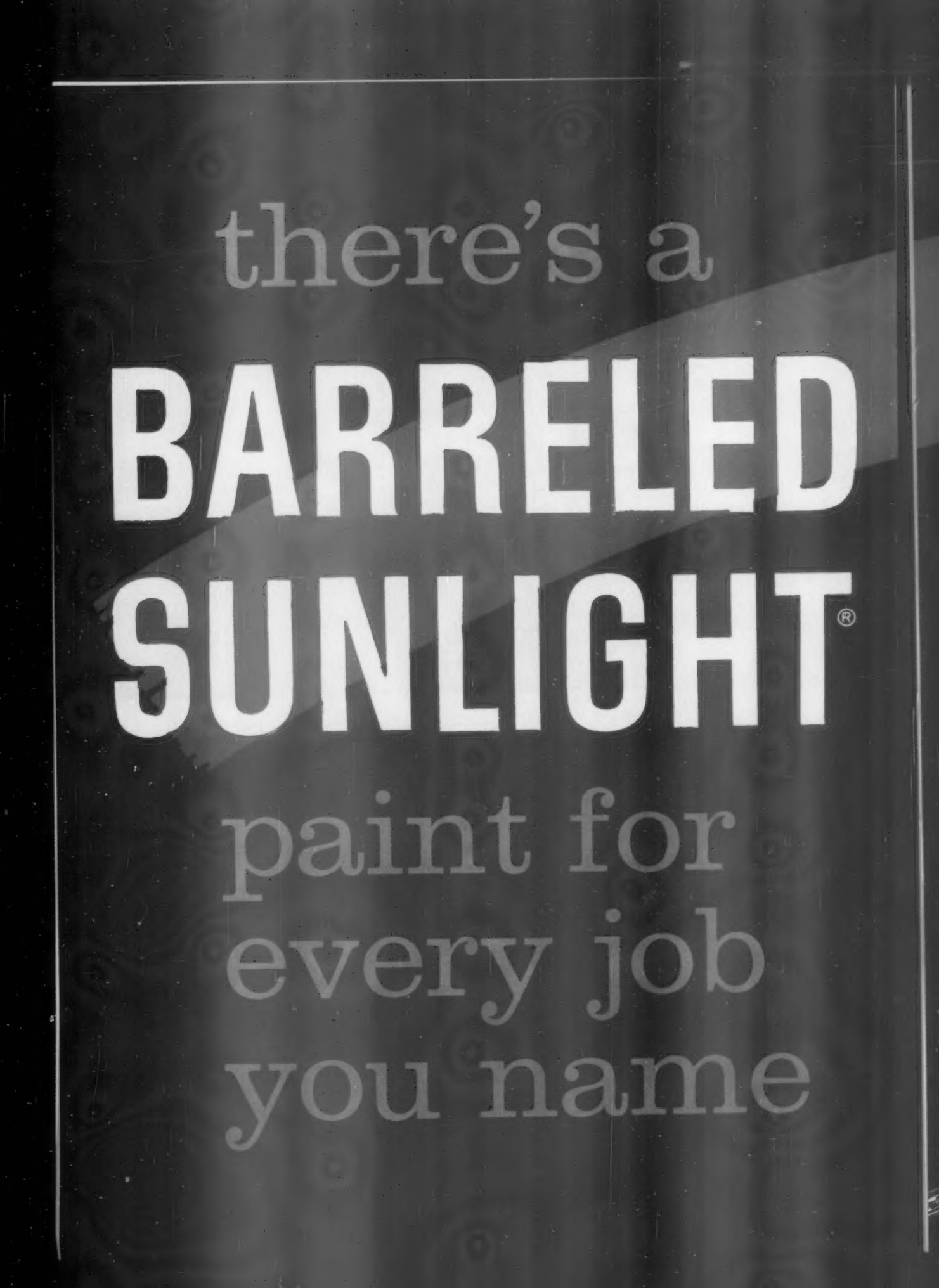
SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Conveyorized Finishing Systems; Metal Parts Washers, Metal Cleaning and Rust Proofing Machines, Conveyorized Cleaning and Pickling Machines; Dry-Off Ovens, Cooling Tunnels, Spray Booths, Electrostatic Spray Enclosures, Flow Coaters, Dip Coaters, Finish Baking Ovens, and Paint Stripping Equipment; Core Ovens, Soldering Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium; Dust and Fume Control Installations, and Many Other Units of Special Plant and Production Processing Equipment.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-659

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

MAHON


there's a
BARRELED
SUNLIGHT®
paint for
every job
you name

NAME YOUR NEED!

These are just a few of the many job-engineered paints in the complete Barreled Sunlight Line

Acid and Alkali Resistant Coating — Barreled Sunlight *Acid and Alkali Resistant Coating* protects against the destructive action of corrosive agents such as acids, alkalies, fumes, gases, water and excessive humidity. Recognized throughout industry for its effective and enduring protection of wood, metal, brick, concrete and other plant construction materials. White and colors.

Aluminum Paints — Barreled Sunlight quick drying Aluminum Finishes provide greatest brilliance, durability and hiding power. *Liquid Aluminum*, for general inside and outside use, resists temperatures up to 300°F; *Heat Resistant Aluminum*, for interior and protected exterior surfaces, resists temperatures up to 600°F.

Machinery Enamel — You need a quick drying, high hiding, oil and grease resistant finish for the maintenance of machinery and general equipment. Barreled Sunlight *Machinery Enamel* has all these, plus outstanding adhesion, toughness and flexibility. Dries to a light-diffusing "modified gloss" which eliminates objectionable glare. All popular machinery colors.

Mildew Resistant Paints — Where high heat and humidity combine to create mildew, mold, or fungus problems, Barreled Sunlight *Mildew Resistant Gloss* provides the ideal protective coating. Thoroughly field tested under toughest conditions, this specialized white interior finish has excellent whiteness and hiding power.

Rust Inhibitive Coatings — Here's the easy way to "give rust the brush" on all interior and exterior iron and steel. Barreled Sunlight *Chromate-Lead-Oxide Metal Primer* combines the corrosion-inhibitive qualities of zinc chromate, red lead and iron oxide in a durable, weather-resistant synthetic vehicle. For economical protection of exterior metal, specify Barreled Sunlight *Rust Inhibitive Primer* — pure Iron Oxide in 100% linseed oil.

Heat and Fume Resistant Finishes — Where a heavy duty, non-yellowing white paint is required to resist discoloring action caused by a combination of fumes and dry heat, Barreled Sunlight *Chemic Enamel* offers white paint advantages for ceilings and walls of many plant interiors where no other white paint has yet justified its cost.

Ceiling and Wall Paints — For heavy duty maintenance painting of new or old plant interiors, specify Barreled Sunlight *"Super Hiding" Interior Finishes*. Intense opacity often permits one-coat repainting under conditions which normally require two coats. Flat, Eggshell, Semi Gloss and Gloss. Non-yellowing Whites plus engineered Wall and Dado Colors.

If you have a paint problem, it will pay you to call in a trained Barreled Sunlight representative for practical recommendations. He will be happy to show you how you can make substantial savings in material and labor *over any paint you have ever tried in the past!*

FREE "Color Survey" To make the best use of paint and color we invite you to take advantage of the Barreled Sunlight "Engineered Color" Survey. At your request — and without obligation — a Barreled Sunlight representative will make a personal survey of your plant and submit recommendations for a complete, practical painting plan. Try this free service now.

Barreled Sunlight Paints

ENGINEERED

FOR A BETTER LOOKING, LONGER LASTING PAINT JOB AT LOWER COST

BARRELED SUNLIGHT PAINT COMPANY
2-K Dudley Street, Providence 1, Rhode Island

☐ Please send me your color chip catalog showing the complete line of Barreled Sunlight Heavy Duty Maintenance Paints.

☐ I want to try your free "Engineered Color" Survey Service. Please have your representative contact me for an appointment.

Name.....

Company.....

Street.....

City..... *State*.....

Constantly drenched by a mist of oil ... yet Dayton Cog-Belts* LAST OVER 20 TIMES LONGER

—Mr. Darrell Kemler, Maintenance Foreman,
Union Steel Products Company, Albion, Michigan.

"There's always a mist of oil around each of our 28 wire-straightening and cut-off machines," states Darrell Kemler, Maintenance Foreman for Union Steel Products Company. "That's why ordinary V-Belts won't last more than 5 to 7 days and why we were spending an average of $700 a week just to replace V-Belts that were stretching, slipping and finally breaking.

"That was three years ago, before we switched to oil-resistant Dayton Cog-Belts. The life of a Cog-Belt? It's 24 hours a day, 5 days a week, for an average of seven months . . . or at least 2000% longer than any V-Belt we've used before.

"Aside from the very obvious advantages, we've practically eliminated one of the dirtiest and most time-consuming jobs in the plant. Changing a set of belts meant a man literally worked in a pit of oil while he took the machine apart. And, it used to be a 24 hour job . . . requiring an extra millwright on the night shift. Cog-Belts effectively reduced this excess overhead.

"As soon as we'd switched to surer-gripping Dayton Cog-Belts we found they increased production by maintaining constant torque. That's important because we must maintain a constant ratio between arbor speed and wire feed. When belts slip, the wire can't be straightened, or worse, we get galled wire which is seldom detected until after the product is assembled and plated. Obviously, all this defective material ends up in the scrap pile.

"Part of the tremendous success we've had with all kinds of Dayton V-Belts is due to the training and trouble-shooting help that Dayton gives us. Through meetings, trouble-shooting clinics, motion pictures and demonstrations, all our men have learned the proper way to use and install V-Belts and how to analyze power transmission problems. We feel the Dayton Preventive Maintenance Program saves us hundreds of dollars."

For more information and help in solving your power transmission problems, see BELTING in the Yellow Pages for the name and phone number of your nearest Dayton Distributor. Or write the Dayton Rubber Company, Industrial Replacement Division Dayton 1, Ohio.

*T.M.

"Here's a Cog-Belt on the wire-straightening and cut-off machine that is constantly sprayed with oil. Still, it gives us seven months service without slipping where another belt would fail in a week."

Shown (l. to r.) with Mr. Kemler are Mr. Ernest Weber of Kendall Hardware-Mill Supply Co., who first recommended Cog-Belts, and Ross Annatoyn, the Dayton Rubber Co. representative.

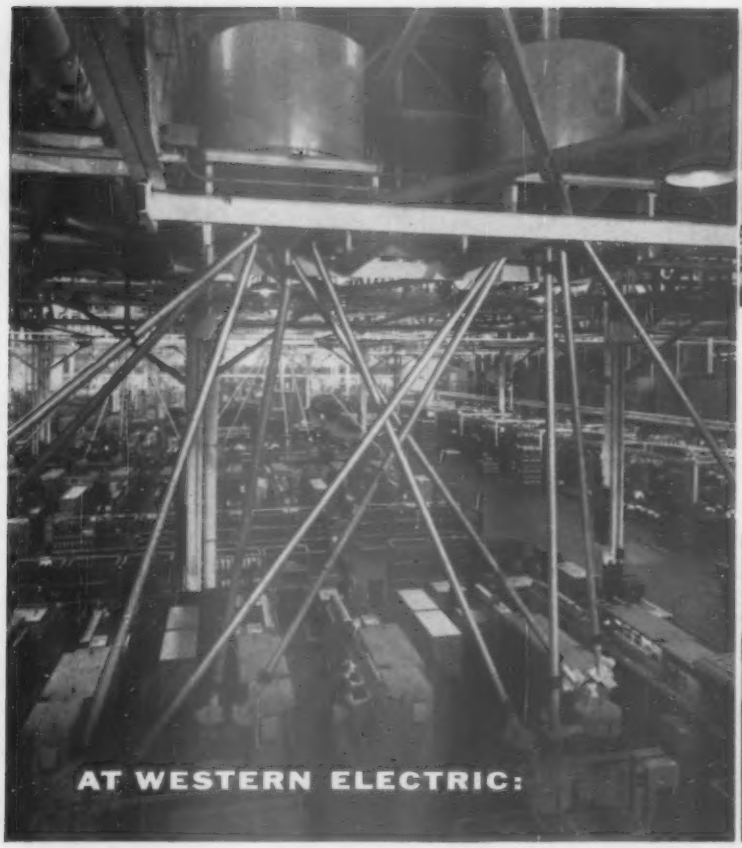
"No other belt can touch the efficiency of Dayton Cog-Belts. We use them on this eccentric cam-operated basket trimmer because of their sure-gripping die-cut edges and their ability to transmit up to 40% more horsepower without slipping."

Dayton Rubber

World's Largest Manufacturer of V-Belts

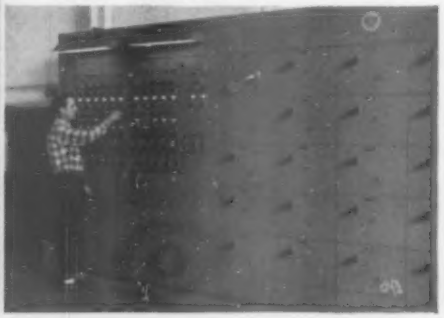
THE DAYTON RUBBER COMPANY • INDUSTRIAL DIVISION • DAYTON 1, OHIO

For more facts circle 484 on Reader Service Card



Material is unloaded from collapsible rubber containers by Airstream Conveyors and distributed directly to process with no chance of contamination.

One man per shift controls operation of production-distribution system which provides high-volume, high-purity in-plant handling of polyethylene to meet requirements of Western Electric's new cable insulating and sheathing methods.



Dracco *Airstream* Conveyors provide automatic in-plant materials distribution

Performance scope of Dracco Airstream Conveyors extends far beyond conventional "unloading" applications.

Proof of this is Western Electric Company's Point Breeze Works in Baltimore, where the in-plant bulk handling system represents a milestone in the application of pneumatic conveying. Airstream Conveyor Systems provide highly automatic in-plant distribution of polyethylene for cable insulation and sheathing.

Two main systems, one for insulation and one for sheathing, do the job. The insulation system consists of eleven conveyors which supply eleven colors of polyethylene pellets through eleven manifolds and sixty-two feed pipes to forty-two insulating extruders. The sheathing system handles black polyethylene through five conveyors and two manifolds to eight extruders. Conveying distances are up to 700 feet from areas where material is received in collapsible rubber containers. Controlled from central panels, the systems have operated continuously for a year without production difficulties.

Airstream Conveyors integrate easily with other automatic production processes. They adapt readily to plant layout. They will move any dry bulk material from any number of sources to any number of destinations. Their self-cleaning action permits handling of different materials in quick succession without intermixing. All systems are completely enclosed to prevent dust, waste and contamination.

Cost-saving, versatile performance benefits like these will give you the *advanced* answer to your in-plant bulk handling problem. Call or write Dracco today.

DRACCO DIVISION OF FULLER CO.
4075 East 116th Street • Cleveland 5, Ohio

New 32-page brochure presents detailed information on how Dracco Airstream Conveyors have solved bulk materials handling problems. Write for Bulletin 530.

DRACCO *airstream* conveyors
dust control equipment

Packing Cost: 3 cents per ton

One steel strap packages this ten-ton steel coil. The strap is regularly applied in about thirty-six seconds. A Signode Model PN air power stretcher pulls the strap to 1600-pound tension every time; a Signode Model RCN 114 air power sealer applies the seal. There's no waste strap, and the cost of the strap and the seal together is only about 27 cents. The strength and low cost of the steel strapping itself, plus the speed and simplicity of application, rule out any other way of doing the job.

Find out how Signode strapping, tools, and skilled helpfulness with methods can make your product cost less to handle, store, ship and receive. There's no obligation...just call the Signode man near you, or write:

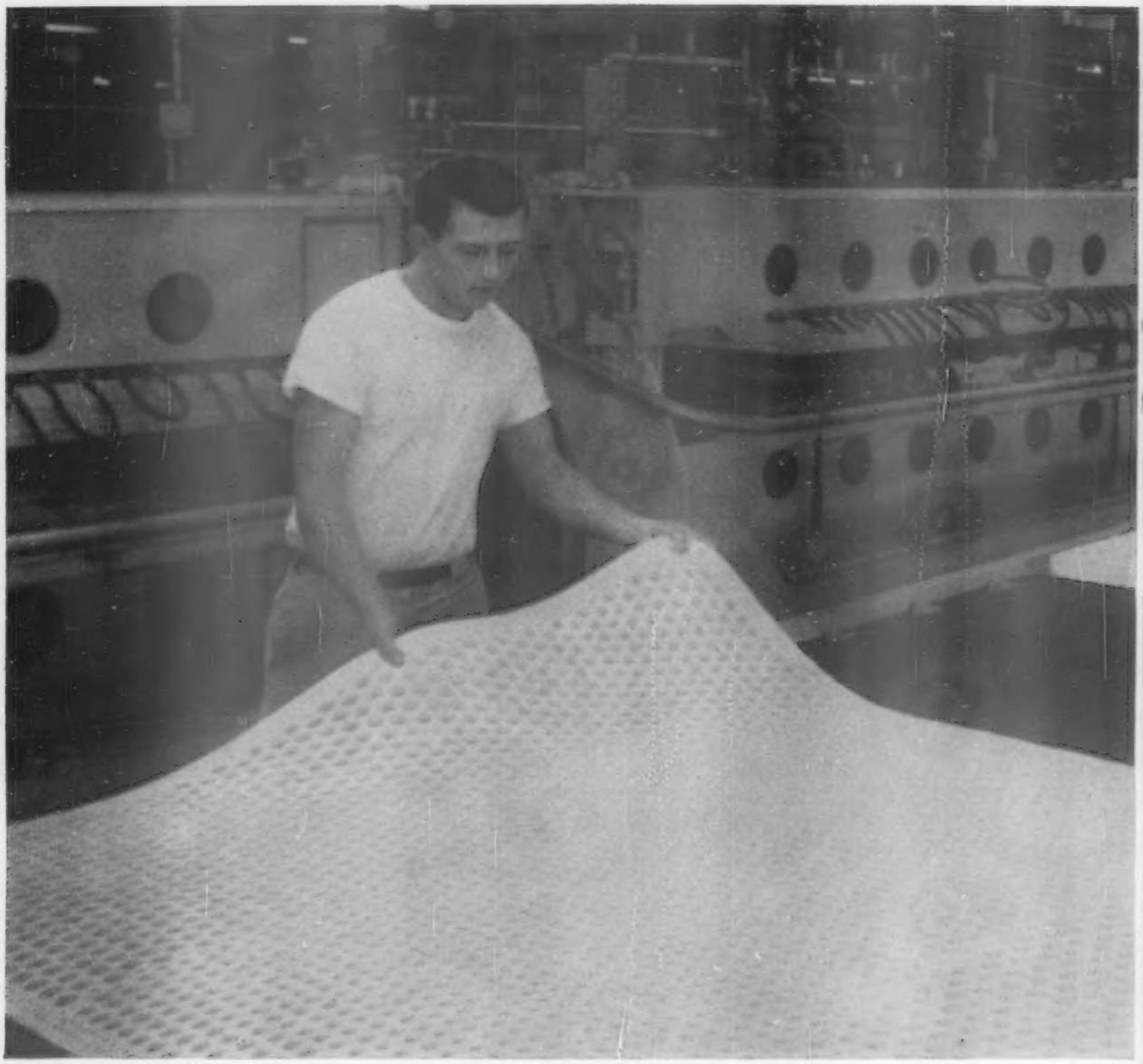
First in steel strapping

SIGNODE STEEL STRAPPING CO.

2663 N. Western Avenue, Chicago 47, Illinois

Offices Coast to Coast. Foreign Subsidiaries and Distributors World-Wide
In Canada: Canadian Steel Strapping Co., Ltd., Montreal • Toronto

For more facts circle 486 on Reader Service Card



125 B. F. Goodrich presses, using Gulf Harmony Oil, mould

GULF MAKES THINGS

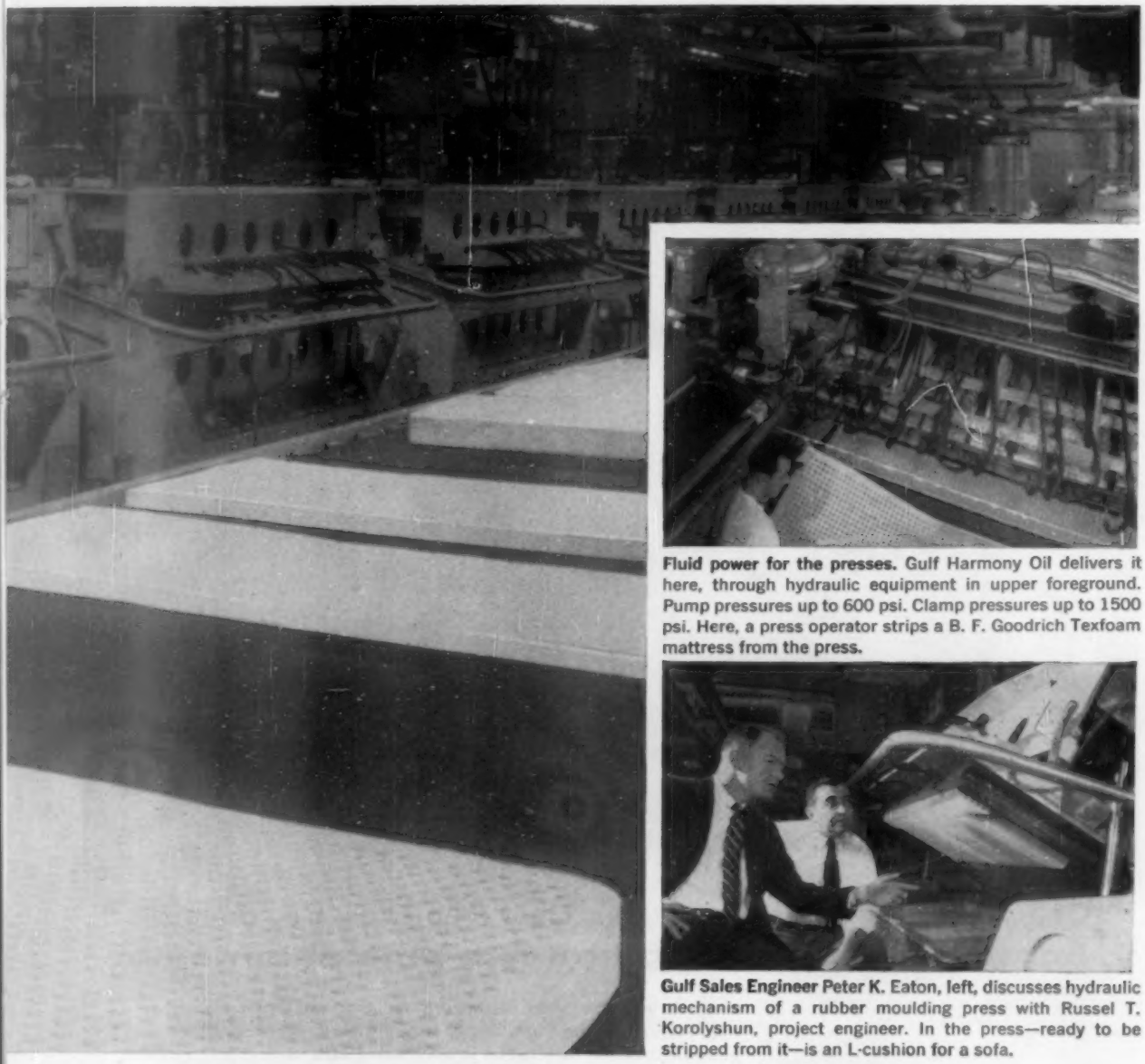
"We'd be up to our necks in expensive scrap if we used an inferior hydraulic oil," says Alex Sandomirsky, chief engineer at the B. F. Goodrich Sponge Products Division in Shelton, Connecticut.

The plant turns out highest quality B. F. Goodrich Texfoam mattresses, pillows, auto seat and furniture cushions around the clock. It has the world's largest installation of rubber moulding presses, 125 of them on one central, 700-gallon hydraulic system. The oil in this system *has* to be reliable, for if one press went out all would have to close down.

B. F. Goodrich uses Gulf Harmony Oil 53 as the power medium, serving these presses 24 hours a day, 6 days a week . . . tough service for any hydraulic oil. Gulf Harmony stands up perfectly in this operation, to the complete satisfaction of B. F. Goodrich. Production results are excellent.

Here's why Gulf Harmony Oil stands up so well, so long

New Gulf Harmony has outstanding oxidation resistance. It assures longer life, freedom from harmful sludge deposits. An anti-corrosion additive protects against rust. A patented anti-foam agent eliminates objection-



Fluid power for the presses. Gulf Harmony Oil delivers it here, through hydraulic equipment in upper foreground. Pump pressures up to 600 psi. Clamp pressures up to 1500 psi. Here, a press operator strips a B. F. Goodrich Texfoam mattress from the press.

Gulf Sales Engineer Peter K. Eaton, left, discusses hydraulic mechanism of a rubber moulding press with Russel T. Korolyshun, project engineer. In the press—ready to be stripped from it—is an L-cushion for a sofa.

foam rubber 24 hours a day...

RUN BETTER!

able foaming. Original viscosity and color stability are retained longer.

As a multi-purpose lubricant and hydraulic fluid, Gulf Harmony Oil is available in a full selection of grades to meet all your needs. It is ideal for hydraulic systems, air compressors, blowers, dryer-roll bearings, machine tools, electric motors, central circulating systems and a host of other applications.

Your Gulf Sales Engineer can show you how Gulf Harmony Oil can help you improve production and reduce maintenance costs. Just call your nearest Gulf office, or write for illustrated bulletin.

GULF

GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

Without obligation on my part, send me illustrated bulletin on Gulf Harmony Oil.

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

FNM-9218

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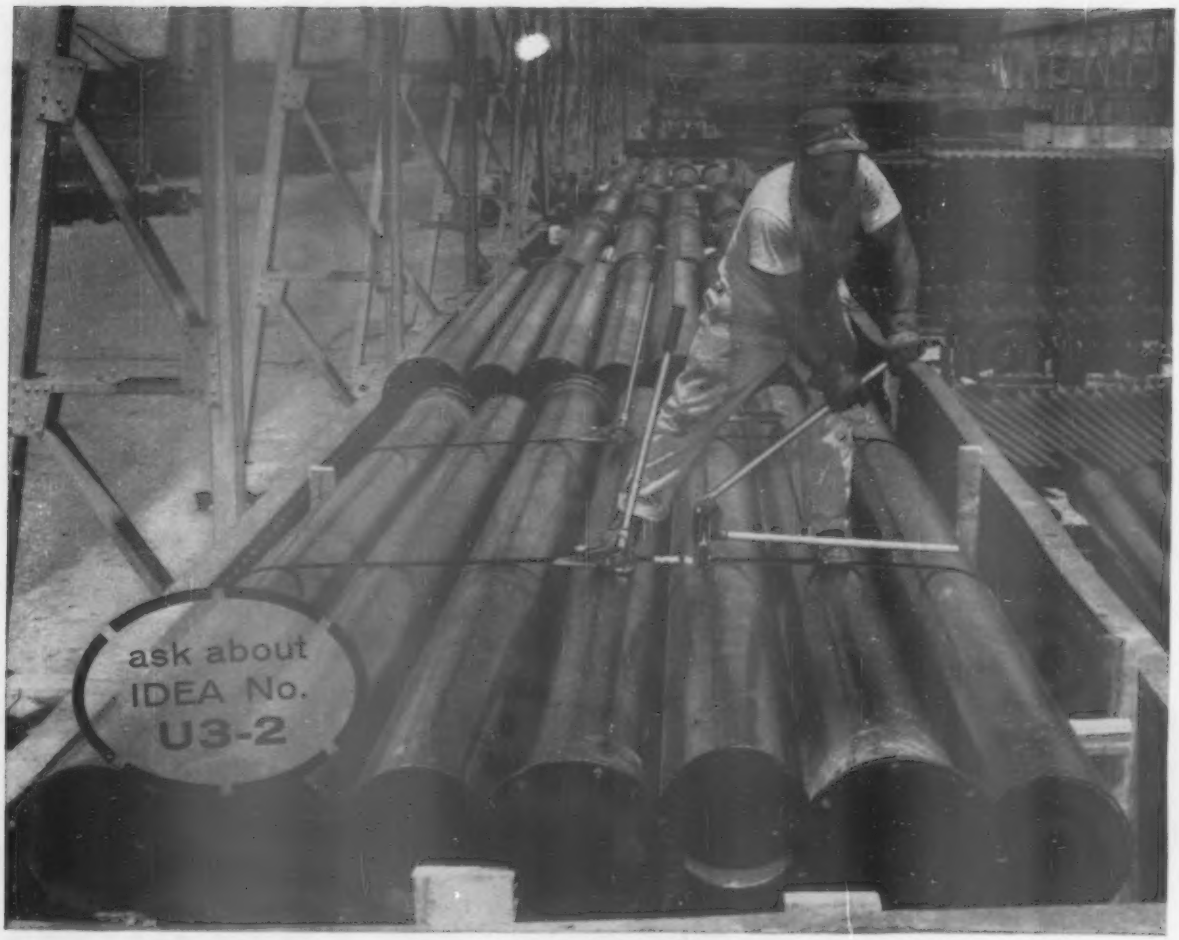


Call your AIM*... Pacific States Cast Iron Pipe Co. does...

Acme Steel Strapping protects pipe shipments

Wayne Dabb works with Pacific States Cast Iron Pipe Co. to solve their product protection problems.

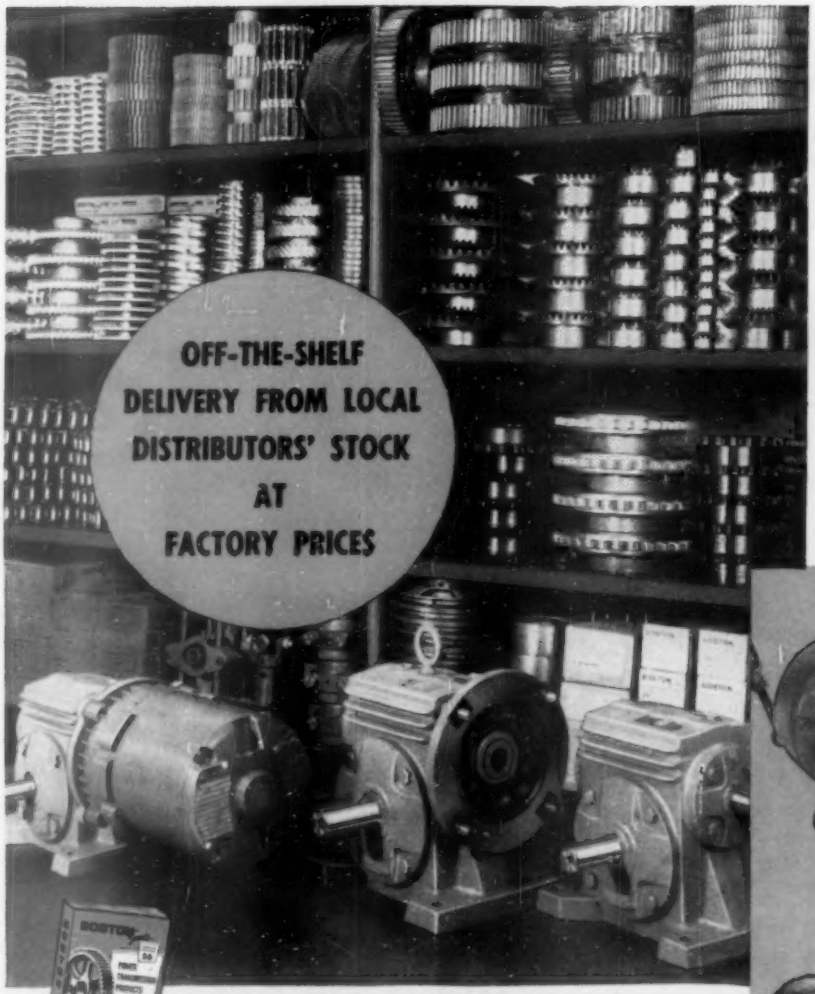
PACIFIC STATES CAST IRON PIPE CO., PROVO, UTAH, wanted to improve arrival condition of cast iron pressure pipe shipped in gondola cars. So they called in their Acme Idea Man.

Together, they arrived at a bracing method using heavy-duty Acme Steel Strapping that virtually eliminated in-transit damage (Idea No. U3-2). Lengths of lumber are placed on the sides and bottom of a gondola car and four lengths of strapping are laid in position. Pipe is loaded and strap is tensioned and sealed, resulting in two secure units.

Now pipe arrives in damage-free condition and is faster to unload since orderly lading presents no unusual materials handling problems or hazards for consignee personnel.

***Call your Acme Idea Man.** He has scores of time-saving, product-protecting ideas, many of which may help you. Write Dept. FAU-118, Acme Steel Products Division, Acme Steel Company, Chicago 27, Illinois. In Canada, Acme Steel Company of Canada, Ltd., 743 Warden Ave., Toronto 13, Ontario.

ACME STEEL STEEL STRAPPING



Catalog lists 7124 Standardized Products

STOCK GEARS • SPROCKETS and CHAIN • SPEED REDUCERS
BEARINGS • PILLOW BLOCKS • COUPLINGS • PULLEYS

You simplify planning. Select all the parts you need from one source – the Boston Gear Catalog.

You save time and expense. Order from your Boston Gear Distributor for off-the-shelf delivery. Why wait (and pay more) for parts "made-to-order?"

You get top-rated performance. Compare the quality and service life. You'll agree Boston Gear products set the highest standards.

Your Boston Gear Distributor is fully qualified to help you get the maximum benefits from standardization – in lower costs, in simplified servicing. Boston Gear Works, 62 Hayward St., Quincy 71, Mass.

CALL YOUR **BOSTON Gear** **DISTRIBUTOR**

For nearest Distributor LOOK UNDER "GEARS" in the 'Yellow Pages'

INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

Remember — STANDARDIZATION PAYS —®

For cost-wise TRANSMISSION design and maintenance ECONOMY

STANDARDIZE **on BOSTON Gear**

NEW

For SHAFT MOUNTING or BASE MOUNTED to meet any drive condition

BOSTON Gear OPTIMOUNT TRADEMARK

HELICAL GEARED
REDUCTORS
RATIOMOTORS
AND FLANGED REDUCTORS

Call your Distributor for complete information. Ask for Catalog OP-1.

SINGLE or DOUBLE REDUCTION
⅛ to 15 HP drives — 66 models

FROM STOCK!

A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

ROUTE TO:

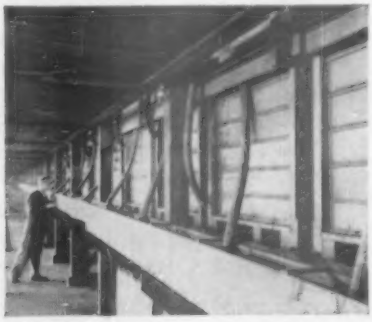
- ☐ ENGINEERING
- ☐ PRODUCTION
- ☐ SALES
- ☐ PURCHASING
- ☐ MAINTENANCE
- ☐ CONSTRUCTION
- ☐ _____

Fir plywood roof decking saved $3,000 on this 25,000 square foot elementary school in Tacoma, Washington, and helped bring the job in well under the original bid. With the architects' approval, the contractor switched from two-inch T&G lumber after cost studies showed that substantial savings could be made by using ¾-inch fir plywood.

While most of the savings came in labor and material, some ten to fifteen per cent came in the use of metal "H" clips which replaced lumber blocking in supporting panel edges. The clip idea points to new opportunities in reducing costs on commercial and industrial buildings as well as schools. Clips are available nationally; write for details.

Fir plywood pallets give extra capacity, last longer and save 9 lbs. per unit at Heidelberg Brewing Co. The firm has used over 5,200 since 1952; it reports plywood has eliminated pallet failure. Repair costs are negligible. Write for DFPA report on design and use of plywood in pallet construction.

Switch from aluminum to fir plywood for these "bottomless boxes" saves $5,000 per year in maintenance and replacement costs for Keeney Truck Lines, Los Angeles. Collapsible boxes have sides, no bottom. They slip over palletized bricks to hold them securely in position during handling, shipping.



Over $30,000 savings in four years was made by switching to overlaid fir plywood for these electro-plating cells. The plywood acid tanks cost only $140 each—$400 to $600 less than rubber-lined steel tanks. Plywood also solved leakage problem which has been encountered with the lumber tanks.

FOR MORE INFORMATION about uses shown or for basic specification literature, write:

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

—an industry-wide organization devoted to research, promotion and quality control

DFPA TESTED QUALITY

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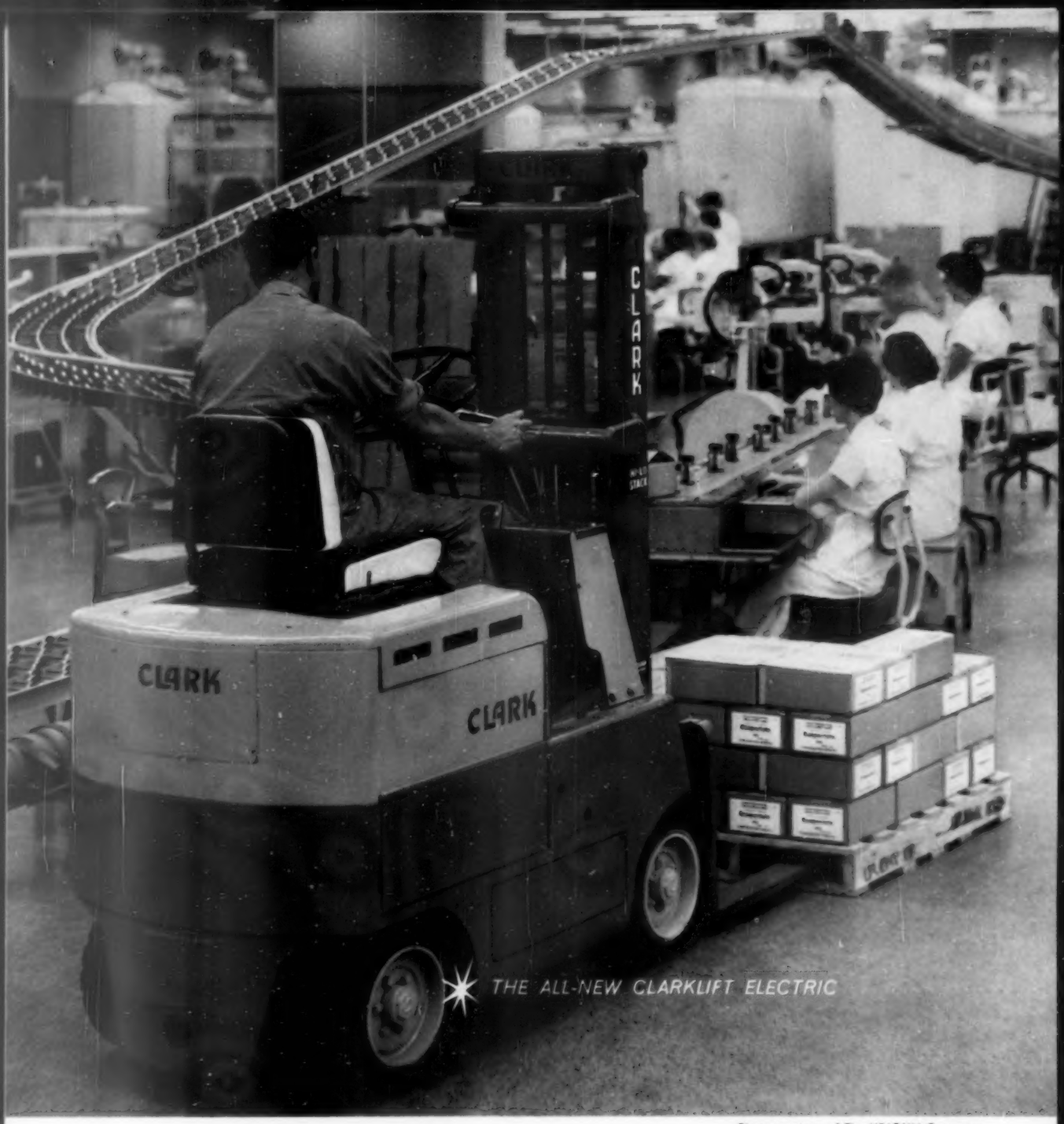


Photo courtesy of The UPJOHN Company

Now! Snail's pace to top speed...no jars, no jolts!

Entirely new! The only electric fork truck that provides smooth, "non-jerk" power-delivery under *all* working conditions.

On the all-new *Clarklift* Electric an infinitely variable speed control provides the *exact* torque necessary for different working conditions and assignments. On ramps, in congested areas, and particularly when inching or stacking . . . power is delivered with perfect regulation. Your driver has *complete* control of the travel speed of his truck at all times, resulting in greater efficiency and safety than ever before possible.

A new upright, one lever for both lift and tilt, self-adjusting brakes, unmatched accessibility are just some of the new features. There are many, many more. Send today for a brochure giving full details. Simply write: New Electrics, Clark Equipment Co., Battle Creek, Mich.

CLARK® EQUIPMENT

CLARKLIFT is a trademark of Clark Equipment Company

ed in U. S. A.

BASIC MODELS

Model 640—Unit Bench

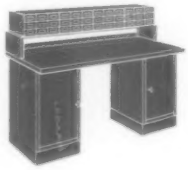
One bench top (steel, Presdwood-covered steel, laminated wood or ShopTop). One 4-drawer pedestal unit. One cabinet unit with adjustable shelf. Two bases.

Model 643—Unit Bench

One bench top (steel, Presdwood-covered steel, laminated wood or ShopTop). Two 4-drawer pedestal units. Each drawer glides on roller bearings, has individual cylinder lock and flush pull. Two bases.

Model 646—Unit Bench

One bench top (steel, Presdwood-covered steel, laminated wood or ShopTop). Two cabinet pedestal units. Each has adjustable shelf, chrome plated locking handle. Two bases.



Space Engineering with Standard Hallowell Shop Equipment

Typical installation of HALLOWELL unit work benches. They can be set up in continuous line, back to back, or singly in shop, lab, toolroom or on assembly line.

makes it easier, faster and more economical to outfit an area and rearrange it to meet changing requirements

Space engineering with standard HALLOWELL Shop Equipment overcomes all the disadvantages of specially designed and custom-built equipment. Its cost is only a fraction that of custom-built units. It is easy to order and get from leading shop equipment dealers; can be set up fast; can be quickly rearranged to meet changing requirements; and is extremely versatile. Standard HALLOWELL interchangeable accessories (backboards, end pieces, top shelves, wire-mold sections, electrical panels, testing panels, and storage wall units) can be added as needed to increase the usefulness of this equipment.

Ask the authorized dealer nearest you for complete information on the standard HALLOWELL line of work benches, shop desks, stools and chairs, tool stands, cabinets, storage walls, shelving. Write Columbia-Hallowell Division, STANDARD PRESSED STEEL CO., Jenkintown 11, Pa.

SPS **Jenkintown • Pennsylvania**

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co. • National Machine Products Co. • Nutt-Shel Co. • SPS Western • Standco Canada Ltd. • Unbrako Socket Screw Co., Ltd.

FOR IMPACT PROTECTION . . .

Our newest spectacle type safety glasses — combining maximum safety with wearer appeal. Yes, they're as good as they look — with true safety frames and true safety lenses. A typically engineered (and exclusive) AO feature is the patented eyewire which is made with a deep groove to hold lenses safely on impact. Other features include 2 tone onyx on clear crystal plastic frame . . . matching spatula or comfort cable temples . . . 6 Curve Super Armorplate Clear or Calobar lenses.

AO 2-TONE ULTRASCOPIC SAFETY GLASSES

FOR SPLASH, SPRAY AND IMPACT EXPOSURES . . .

This new goggle is particularly recommended for use in the chemical industry and in humid operations. Indirectly ventilated for splash-resistant safety yet twice as fog-free as similar goggles. Lightweight, comfortable, with wide angle vision, it fits over all types of personal and safety Rx glasses. Acetate lenses conform to high safety and optical standards.

AO 710 SPLASH GOGGLE

In Plant after Plant . . .

AO SAFETY GLASSES

like these Save Workers' Eyes and Thousands of Dollars Annually

If you're searching for every possible way to cut needless costs — consider an American Optical Eye Protection Program. It works! One metalworking company saved 119 eyes and $615,000 the past five years . . . another cut lost production time in hours from $3.36 per employee to $.23 in 1½ years . . . another saved 38 eyes and $328,000 the past seven years. For complete details about an eye protection program, write us direct or call your nearest AO Safety Representative.

Always insist on AO Trademarked lenses and frames

American Optical COMPANY
SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts
Branches in Principal Cities

1833-1958 • 125 LEADERSHIP YEARS

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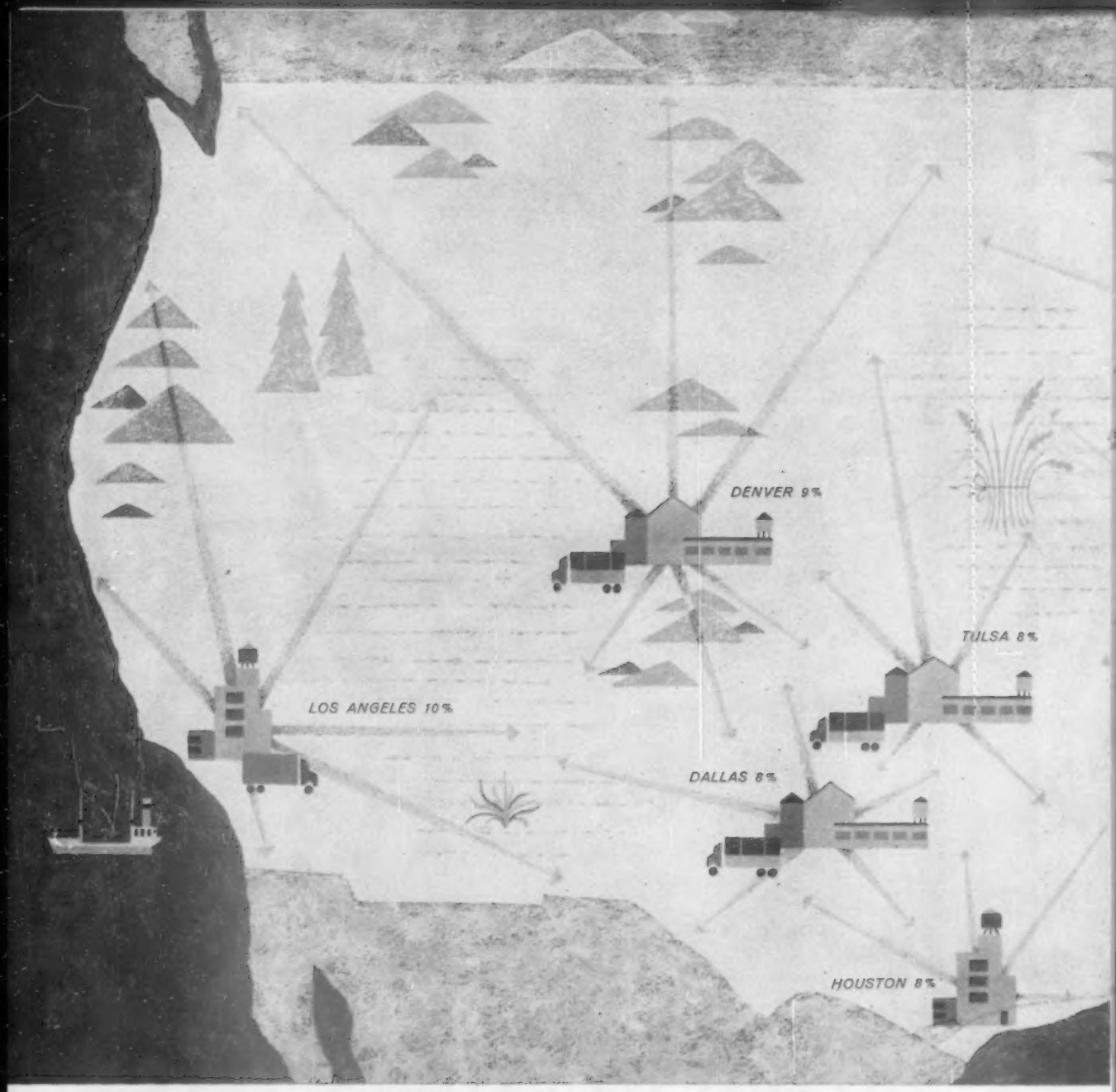


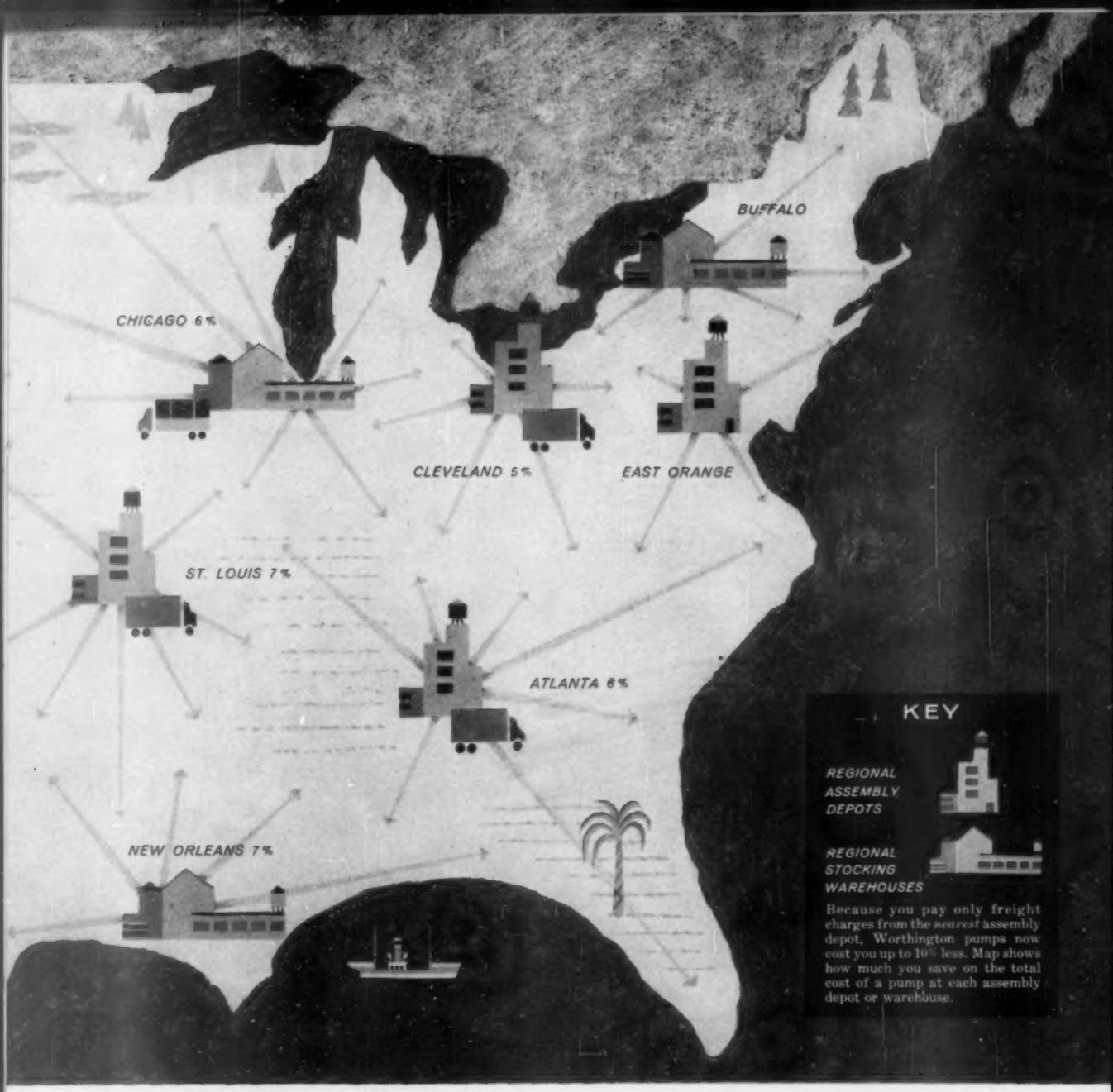
NEW SAVINGS ON

Look at the map to see how much *less* you pay!

Worthington has reduced the cost of SESC pumps by spanning the nation with *new regional assembly depots.* In addition to the primary depot in East Orange, (N.J.), others have been established in Cleveland, Atlanta, St. Louis, Houston and Los Angeles. Worthington can now pass along savings to you in three ways. One, on the price: as much as 10% depending upon your location. Two, on time—because your order can be processed and shipped in a matter of hours. Three, on parts service—because each of the assembly depots maintains a stock of spare parts.

In addition to assembly points, Worthington also maintains stocks of completely built pumps in Buffalo, Chicago, Denver, New Orleans, Dallas and Tulsa.

But there are other reasons why SESC (standard end


BUFFALO
CHICAGO 6%
CLEVELAND 5%
EAST ORANGE
ST. LOUIS 7%
ATLANTA 6%
NEW ORLEANS 7%
KEY
REGIONAL ASSEMBLY DEPOTS
REGIONAL STOCKING WAREHOUSES
Because you pay only freight charges from the *nearest* assembly depot, Worthington pumps now cost you up to 10% less. Map shows how much you save on the total cost of a pump at each assembly depot or warehouse.

WORTHINGTON PUMPS

suction centrifugal) is far and away your best pump buy. Standardization gives you a high degree of interchangeability. Pumps may be all iron, all bronze, standard fitted, or Worthite*. 120 different sizes, with open or closed impellers are available with capacities up to 2700 GPM and heads to 550 Ft. Conventionally packed boxes or mechanical seals are optional in all pumps, and conversions from packed boxes to seals may be made on units in the field. All in all there are 70,480 modifications of the SESC pump to choose from—the broadest combination the pump industry has to offer.

SESC pumps also give you these benefits of standardization. You can cut your spare parts inventory by 50% because only four bearing frame sizes are used for the entire 120-pump line, and all pump parts are interchangeable. This means reduced downtime if repair or conversion is made. Finally, one basic design for the complete line simplifies maintenance and lowers overall operating costs.

Take advantage of the new low costs—the speeded delivery—the many outstanding features of the Worthington SESC line now. For detailed information, write for Bulletin W-300-B4 Worthington Corporation, Section 20-3, Harrison, New Jersey. In Canada: Worthington, Ltd., Brantford, Ontario.

*Worthite is a high nickel, high-chromium, low-carbon alloy steel. Trademark Reg. U. S. Pat. Off.

WORTHINGTON

Yale introduces 2 short trucks

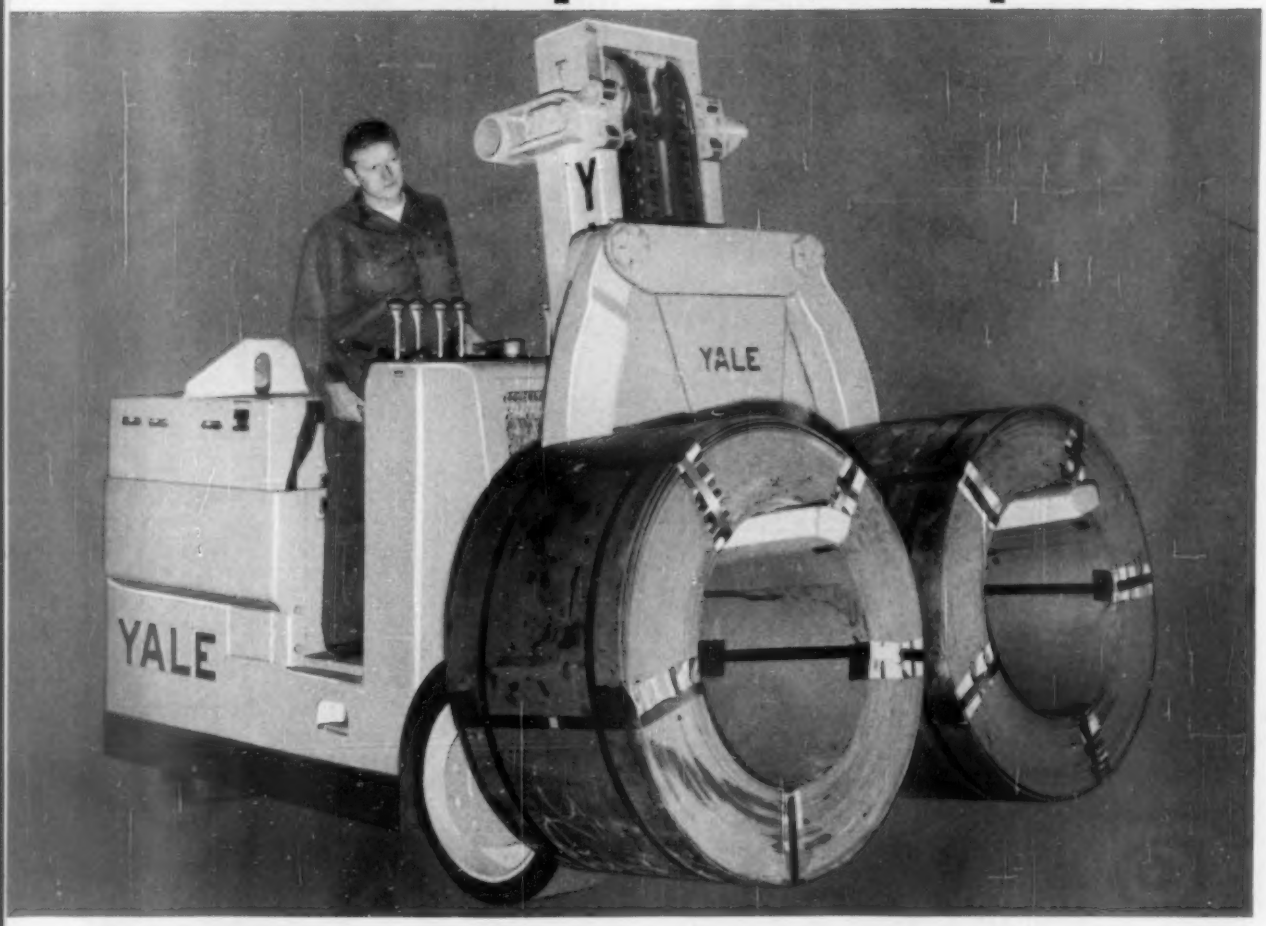
Gasoline

Yale G5 Series—Only Series of its Kind to Feature Rugged Design and Fast Cycle Operations. For heavy industry. • Instant power for fast acceleration from fully automatic torque converter transmission with 2 speed ranges. • Lifting speeds up to 60 ft. per minute. • Turning radius, only 112"—permits easy movement in and out of box cars. • Operator positioned for excellent visibility. • Powerful V-8 industrial engine. • High underclearance. • For use with forks, single ram, hydraulic split ram or specialized attachments. • Available for use with LP-gas. • Capacities: 15,000 to 20,000 lbs.

Both guarantee

Both economical new Yale Trucks—gas and electric—feature famous Yale Integrated Design and premium engineering advances as standard components. You get extra rugged channel assembly—Yale Planetary Drive Axle assembly—hydraulic wheel brakes—tough steel frame construction. For full information about these and other Yale gas, LP-gas, electric, hand trucks, industrial tractor shovels, hand and electric hoists—write The Yale & Towne Mfg. Co., Materials Handling Division, Philadelphia 15, Pa., Dept. A-311.

that handle up to 20,000 pounds



Electric **Yale K410 Series—Combines Heavy-Industry Power With a Turning Radius of Only 92⅝".** Designed for easy serviceability. • Accommodates 60 to 72 volt batteries to meet any power requirement. • Telescopic, hydraulic lift gives maximum lift per overall height. Easy to maneuver in and out of box cars. • Operator has choice of two stations for excellent visibility at all times. • Hydraulic tilt to safety nest-loads speeds handling operations. • For use with forks, single ram, hydraulic split ram or specialized attachments. • Available with engine-generator power unit. • Capacities: 12,000 to 20,000 lbs.

faster cycle operations

YALE* *REG. U.S. PAT. OFF.

YALE & TOWNE

INDUSTRIAL LIFT TRUCKS & TRACTOR SHOVELS • HOISTS

GASOLINE, ELECTRIC, DIESEL & LP-GAS INDUSTRIAL LIFT TRUCKS • WORKSAVERS
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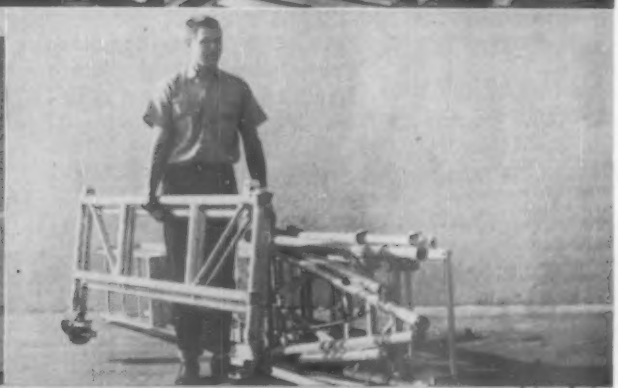
UP-RIGHT ANNOUNCES

TALLESCOPE ...telescoping aluminum work platform for overhead spot maintenance

Lightweight, rapidly assembled by one man. Extends instantly for reaching heights up to 30 ft. Adjustable legs for uneven floors or stairways. Only 29" wide for rolling through congested areas.



Telescopes and folds down to roll through doorways, under trusses, pipes and conveyors.

Separates easily into 3 components for convenient storage or transportation.

FOR TALLESCOPE CIRCULAR
WRITE TO
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DEPT. 178 • 1013 PARDEE ST., BERKELEY, CALIF.

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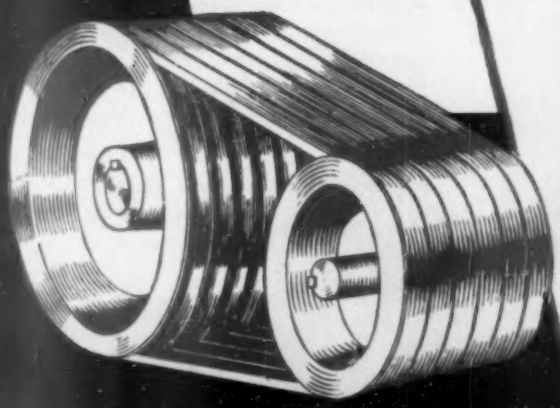
SINCE 1910

V-belt **QUALITY** meeting industry's severest needs

Immediate **SERVICE** to solve customer's problems

Special attention to **CUSTOMER RELATIONS**

Emphasis on dollar **SAVINGS**



DURKEE ATWOOD V-BELTS

DURKEE-ATWOOD CO., Minneapolis 13, Minn.

THEY *get to take a last look inside*

Standard Oil research develops method for inspecting lubrication of enclosed parts without disassembling

What if you had to make a final inspection of enclosed parts to be sure they were lubricated and you could not do it without disassembling? Standard Oil research scientists have just developed an instrument system that determines lubricant level in an instant. The device measures the density of an assembly so precisely the presence or absence of the desired quantity of lubricant registers on a meter.

Having such a unit might permit you to shorten an assembly line or reorganize assembly operations for greater convenience, speed, economy. The research men at Standard who developed this inspection method will be glad to share their know-how with you to help you fit it to your assembly operations.

This is the research pay-out you get from Standard. This is the "something more" Standard gives to industry besides the research which has established Standard Oil petroleum products as the industry criteria for quality.

For more information about this development or for assistance on other lubrication problems, inquire of any of the 48 Standard Oil district offices in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and get it!*

ARCHITECTS and ENGINEERS: Skidmore, Owings & Merrill
GENERAL CONTRACTORS: Chell and Anderson
HEATING and PROCESS PIPING: Wm. A. Popo Co.
AIR CONDITIONING and VENTILATION: Cicero Sheet Metal Co.

Efficient Manufacture Employee Well-being

both aided by Clarage "air" in new Avon cosmetics plant

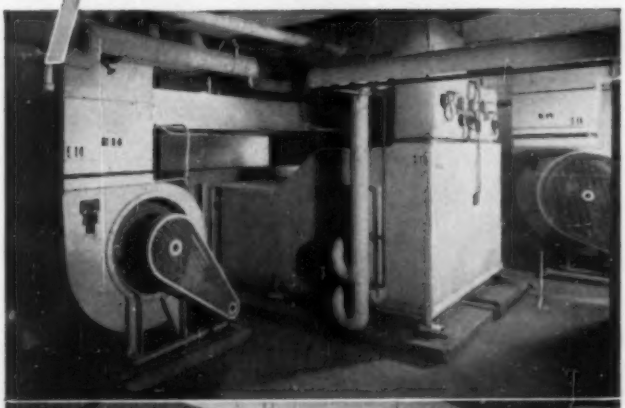
Here is much more than a thoroughly modern manufacturing facility. Here is a national sales center as well.

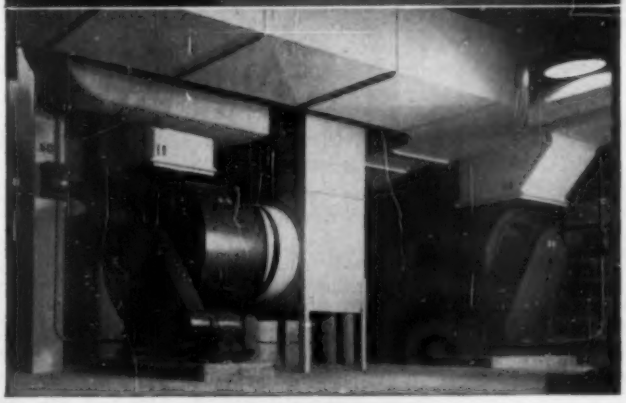
It's the new Avon Products, Inc., plant at Morton Grove, Illinois. From it flow the widely popular Avon cosmetic products. To it come members of Avon's door-to-door sales organization for training and sales meetings.

Air conditioning, thus, has a dual role to play in this structure – for employee comfort and for efficient manufacturing processes.

As for so many other noteworthy buildings, Clarage equipment was selected – some of which is shown on the right. On the job are Clarage Ready Unit ventilating sets, system fans, and Multitherm air conditioning units, including the famous Blow-Thru units pioneered and perfected by Clarage for multi-zone service.

You, too, will find it profitable to specify Clarage for your next assignments – no matter how large, how small. CLARAGE FAN COMPANY, Kalamazoo, Michigan.





CLARAGE ... *dependable equipment for making air your servant*

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

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For more facts circle 499 on Reader Service Card

OPERATING ROOM QUIET is maintained even though a Westinghouse DS-3 dry-type transformer is only a few feet away. "Only well-engineered equipment," states architect Calvin M. Butler, "can achieve both the quiet and constant operation demanded in this location."

Compact new Westinghouse dry-type transformers give "virtually silent" operation in Arizona hospital

Quiet operation and compact construction dictated the choice of Westinghouse DS-3 dry-type transformers for the new Louis Galland Memorial Wing of St. Luke's Hospital in Phoenix, Arizona.

"The importance of quietness in a hospital cannot be overemphasized," comments Mr. Calvin M. Butler, architect of the new wing. "In this instance, the transformers are installed next to the surgical and X-ray rooms where the loud humming often associated with transformers would have disturbed both doctors and patients. The Westinghouse dry-type transformers used here are practically noiseless. No decibel reading whatever can be obtained, even when a meter is placed on the transformer surface."

"In addition to their virtually silent operation," adds Mr. Archie W. Brown, consulting electrical engineer, "these transformers provide a greater margin of safety for overloads and operation in higher ambient temperatures. Yet they are smaller than others designed for the same kva output."

Quiet operation of the DS-3 is assured by use of a new "built-in" mechanical vibration dampening system, which floats core and coils independently of base, case and connecting conduit.

Reduced size—up to 11%—and weight—up to 32%—achieved by use of two Westinghouse exclusives: inorganic Silclad insulation and grain-oriented Hipersil® steel cores.

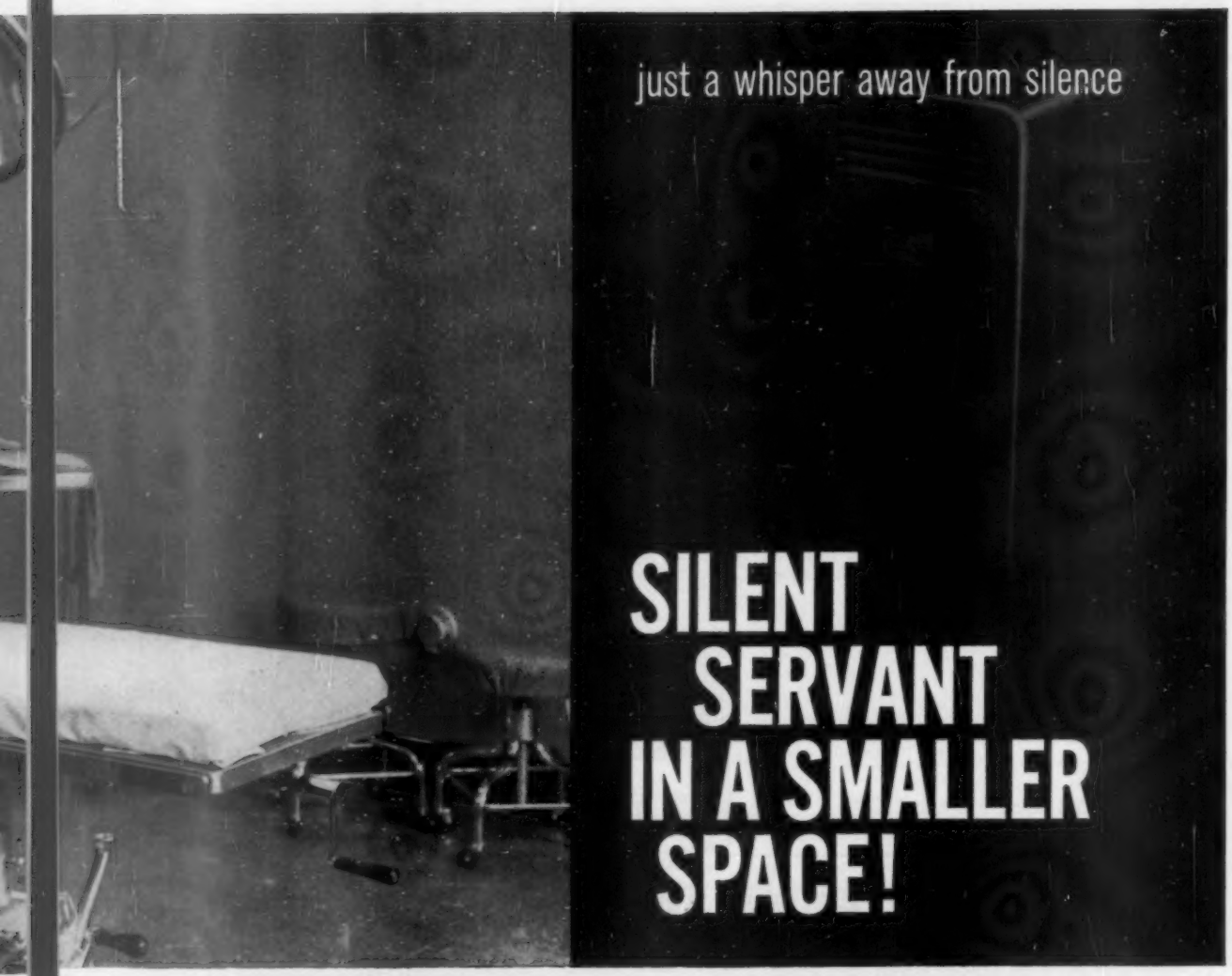
For full information on the advantages of the DS-3 transformer, call your local Westinghouse salesman or distributor . . . or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-70802

YOU CAN BE SURE... IF IT'S

Westinghouse

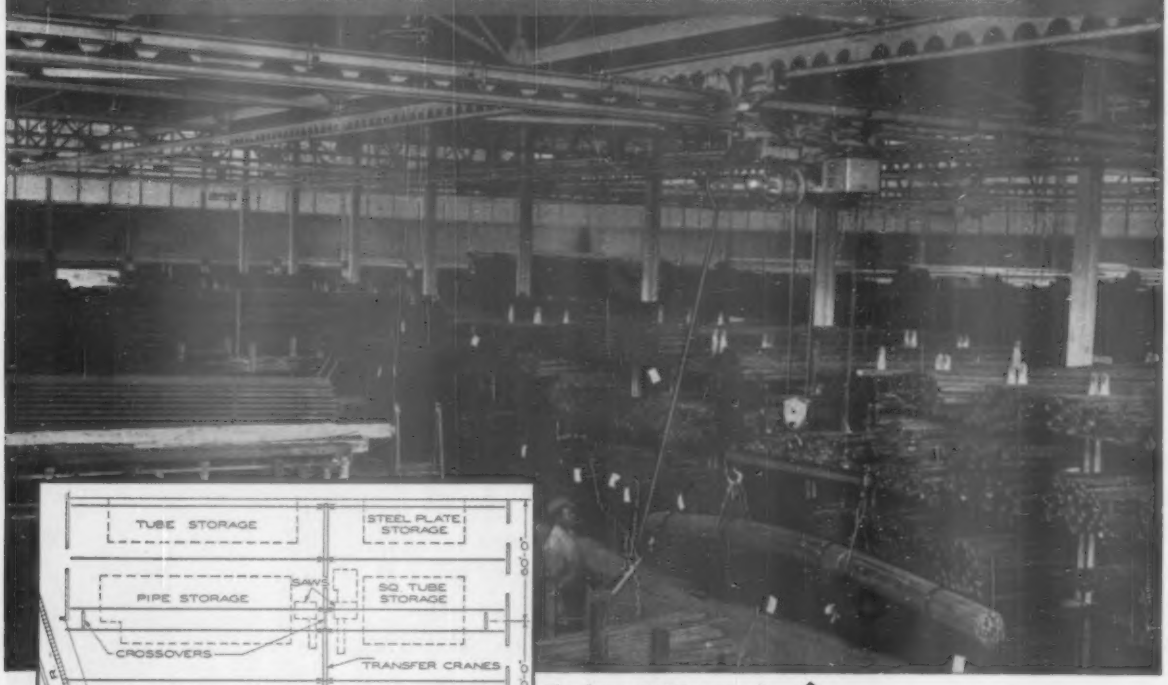
WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

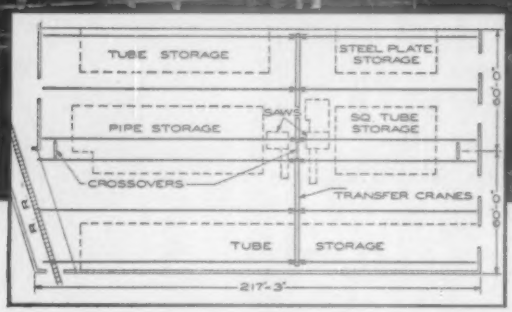


MODERN APPEARANCE of St. Luke's Hospital in Phoenix is matched by the modern performance of Westinghouse DS-3 transformers inside. This is only one of over 30,000 trouble-free installations of "virtually silent" Westinghouse dry-type transformers. Guaranteed quiet by sound testing every transformer in an ambient of 24 db.

Rigid conduit can be used for the DS-3, with no noise transmission from core and coils. Mr. G. C. Parker, Westinghouse representative, "sound tests" this unit, gets no reading above room ambient even with meter on transformer surface.

TRAMRAIL TRANSFER CRANES *SYSTEMATIZE* HANDLING IN STEEL WAREHOUSE





The large storage area is completely covered by Tramrail crane service. Every item can be seen from the floor and readily reached with the two transfer cranes.

▲ The Tramrail transfer cranes make it easy to place the long unwieldly pipes and bar stock into storage at any height. This makes for orderliness, which is an important factor in securing high operating efficiency.

A LARGE modern warehouse at Atlanta, Georgia, was designed to make use of overhead Tramrail equipment to enable the handling of large unit loads in and out of storage with the least effort and in the quickest time.

The principal storage section is provided with two parallel runways each having three tracks. On both runways is a 64-foot transfer crane that travels the length of the room. Cross-overs are provided, enabling a hoist carrier transferring from one crane to the other. This makes it possible to haul materials between any two points in the entire area without rehandling.

Steel is constantly on the move in this active plant. From 60,000 to 70,000 lbs. are brought in by railroad car daily and like amounts are shipped out. The material is unloaded from railroad cars at one end of the building and placed into storage. It is shipped out on trucks which are loaded at the other end.

The overhead crane system makes it possible to place incoming materials into allotted storage spaces at once. The need of storing temporarily in aisleways or other areas and extra handling which this entails is eliminated. Thus, the warehouse is kept orderly at all times and every item is readily seen and conveniently reached. Danger of handling accidents is minimized and overall efficiency is unusually high.

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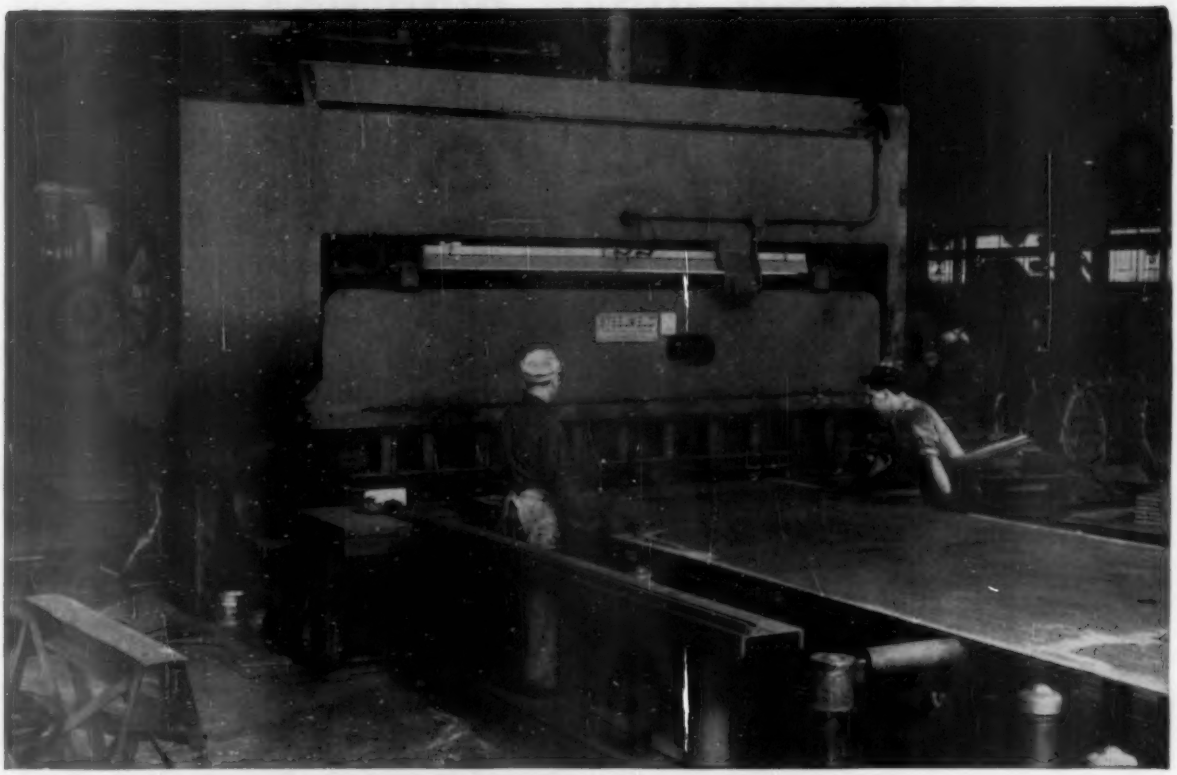
BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3281 East 284 Street, Wickliffe, Ohio

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT



Pivoted-Blade Shears Outstanding for Heavy Plates

Steel plates up to 10' x 1" are quickly cut on this Steelweld. A complete line of machines is available for every thickness from light gauge to 1½" and every length from 6'-0" to 24'-0".

WHILE Steelweld Shears are used in hundreds of plants for cutting every gauge of metal, it is on heavy plate where the easy accurate cutting action of the machine is really eye catching. With nothing more than a quick "oomph" the knife goes through the metal quickly and cleanly, seemingly without effort. The resulting cut edges are straight and sharp.

Steelweld Shears are now cutting steel up to 1½ inches thick. A wonderful feature is the ease and speed with which the heavy plate machines can be adjusted to cut the lightest gauge metal. In a matter of seconds the clearance between the knives can be reduced to that known to provide the best result for the thickness of the plate being cut. This is done simply by turning a crank until a gauge indicator is on the correct thickness figure. This feature is known as MICRO-SET knife adjustment and is the talk of the industry.

Production is fast on Steelwelds because they are heavily built to enable high operating speeds. Also, they are equipped with electric foot control. This reduces operator fatigue and often eliminates many steps he must take to the machine.

If you want the most modern machine, with outstanding features that make for the finest in all around performance — tried and proven features, some of which are not obtainable in any other shear — we invite you to get the facts on Steelwelds.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

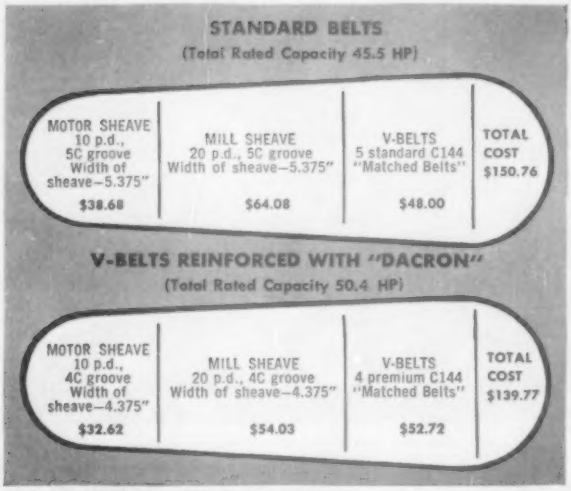
THE CLEVELAND CRANE & ENGINEERING CO.

3247 East 282nd Street · Wickliffe, Ohio

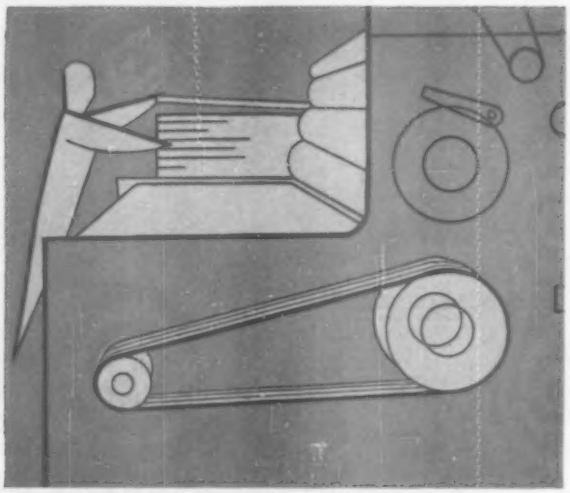
STEELWELD PIVOTED BLADE SHEARS

You can make significant cost savings with premium V-belts reinforced with DACRON

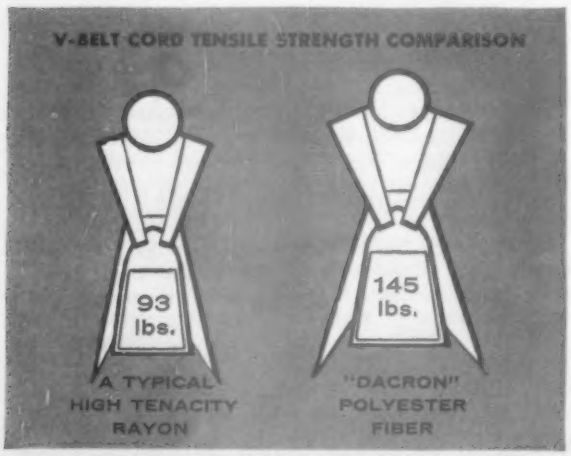
REG. U. S. PAT. OFF.


STANDARD BELTS
(Total Rated Capacity 45.5 HP)
MOTOR SHEAVE 10 p.d., 5C groove Width of sheave—5.375" $38.68
MILL SHEAVE 20 p.d., 5C groove Width of sheave—5.375" $64.08
V-BELTS 5 standard C144 "Matched Belts" $48.00
TOTAL COST $150.76
V-BELTS REINFORCED WITH "DACRON"
(Total Rated Capacity 50.4 HP)
MOTOR SHEAVE 10 p.d., 4C groove Width of sheave—4.375" $32.62
MILL SHEAVE 20 p.d., 4C groove Width of sheave—4.375" $54.03
V-BELTS 4 premium C144 "Matched Belts" $52.72
TOTAL COST $139.77

LOWER INITIAL DRIVE COST. Right from the start, premium V-belts reinforced with Du Pont "Dacron"* polyester fiber save you money! These belts offer greater horsepower capacity, a more compact drive that's easier to maintain.



"LASTED 52 TIMES LONGER than regular V-belts," reports a user of premium belts made with "Dacron". The rugged wearability of "Dacron" fiber extends belt life . . . permits continuous use without costly take-up for belt adjustment.



LESS MAINTENANCE, REDUCED INVENTORY. Even when compared with tough fibers of a high tenacity rayon V-belt cord, "Dacron" proves far stronger. In belts, this means less stretch, minimized matching problems and lowered inventory.

Premium V-belts reinforced with "Dacron" are ideal for high-impact or shock-load drives, yet last far longer than ordinary belts. In a typical installation, 5 premium belts reinforced with "Dacron" did the work of 7 conventional belts. Important economies resulted, too—through longer belt life and by reduction of the number of belts and sheaves.

In standard V-belts, too, the stability of "Dacron" practically eliminates matching problems . . . permits smaller belt inventories.

Check the cost-saving advantages of premium or standard V-belts reinforced with "Dacron" for the next drive you design or install. Du Pont makes the "Dacron" used by belt manufacturers in producing their finest-quality belts. E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Department, Wilmington 98, Delaware.

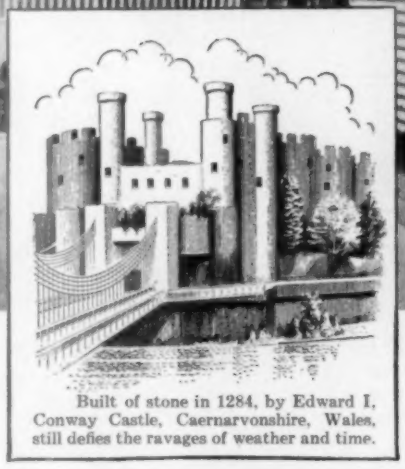
""Dacron" is Du Pont's registered trademark for its polyester fiber.*

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

V-BELTS REINFORCED WITH "DACRON" transmit more horsepower . . . stand greater shock loads . . . give longer flex life . . . give greater opportunities for machine-design improvement.



Built of stone in 1284, by Edward I, Conway Castle, Caernarvonshire, Wales, still defies the ravages of weather and time.

For Permanence, Economy and Decorative Effect

Johns-Manville Corrugated Transite® wears like stone

Corrugated Transite sheets, made of asbestos fibre and cement, formed under great pressure, possess unusual strength, rigidity and durability.

Like the famous old stone castles, thousands of original installations of Corrugated Transite are still giving service and protection, under conditions which destroy other forms of walls and roofing.

You save money on maintenance with this asbestos building sheet. It can't rot, can't rust, can't burn. It has high resistance to acids, to gaseous fumes, to severe temperatures, to vermin and insects.

Simple and pleasing shadow-line effects in decorative design are achieved by installing Corrugated Transite vertically or horizontally. Sheets are of a light gray color. Design possibilities can be expanded by combining Corrugated Transite with other types of building materials. Transite may be painted where desired.

For additional information on how you can have a long-lasting structure, write for new Corrugated Transite brochure. Address: Johns-Manville, Box 158, New York 16, N. Y. In Canada: 565 Lakeshore Road East, Port Credit, Ontario.

JOHNS-MANVILLE

JOHNS-MANVILLE JM PRODUCTS

"Maybe there's a steel to do it better . . . ask Ryerson!"

If there is a better steel for your operation, Ryerson can tell you. A Ryerson specialist will assist you in solving the problems of steel application and fabrication, too.

Ryerson strategically located plants carry large stocks to meet virtually every steel need. That's why the Ryerson specialist will suggest only the best steel for the job. He can offer you facilities and experience to help with design problems.

And as the Ryerson specialist works with you on problems of steel selection, he will also develop a plan for efficient delivery. This means a smoothly flowing production line while inventory investment is kept at a minimum.

There's a steel specialist at your nearby Ryerson plant ready to work with you. So—when you have a question of the best and most economical steel to use, ask Ryerson.

RYERSON CERTIFIED QUALITY

RYERSON STEEL®

Member of the INLAND® Steel Family

Principal Products: Carbon, alloy and stainless steel—tubing, bars, structurals, plates, sheets—aluminum, industrial plastics, metalworking machinery, etc.

FACTORY
MANAGEMENT AND MAINTENANCE
. . . PRESS TIME REPORT • NOVEMBER 1958

Looking Ahead in Business

Business will have a banner year in '59—if the pick-up keeps moving at its present rate. Last month's indicators showed this picture:

. . . *Gross national product* up for the third quarter and moving towards a $450-billion rate.
. . . *Industrial production* up another point, despite a big drag in auto output.
. . . *Steel output* pushing past 70% of capacity for the first time this year.
. . . *Personal income* $1.4-billion higher in September because of higher wages and a longer week.
. . . *Unemployment* down to 4.1-million in September, thanks to another spurt in factory jobs.
. . . *Housing starts* at a booming 1.2-million rate —the highest in three years.

Estimates for third quarter GNP put the total value of goods and services at a $440-billion rate. This matches the '57 average, means the economy has recouped about two-thirds of the ground lost. Prime movers in the recovery: defense spending, consumer outlays, housing, turn in inventories. These will push GNP up $10-billion in the fourth quarter.

Preliminary estimate for GNP in '59: About $465-billion or a gain of 6.6% from this year's level.

•

Industrial production sputtered a bit in September with the strikes and model changeover in Detroit. Factory output still moved up a point, although autos dropped from 152 to 57 on the FRB index—the lowest September for cars since 1938.

Outlook for '59: Factory output should move back up into the 145-150 range—higher if autos and capital goods have a good second half. Output is now at 139, some 11 points above April's low.

Steel operations were running at better than 70% last month, compared to under 50% early in the year. Output for '58 will wind up about 85-million tons —maybe back to 110-million in '59.

Factory employment moved up to 15.7-million in September for a net gain of 650,000 workers in the last four months. Moreover, both the workweek and the average weekly earnings continued to improve—moved up to 39.8 hours and $85 (a new record). This helped push personal income up to $356.1-billion—the third monthly gain in a row.

Over-all unemployment dropped from 4.7-million to 4.1-million in September. This is about midway between year-ago figures and the recession high.

•

Housing continues to flourish—1,220,000 starts for September (annual rate), highest since late '55.

Builders would be happy if this housing rate could be maintained throughout '59. On the plus side is consumer income which will rise steadily next year. On the minus side is tighter credit which can pull out the props from the housing market. The interest rate on VA mortgages is already too low to attract lenders in many areas.

Best guess for 1959: 1,150,000 private housing starts, but it could be higher if Congress re-enacts the federal aids to home financing.

FACTORY FIGURES OF THE MONTH

Indicator	Sept. 1958	Aug. 1958	Sept. 1957
New Orders for Machinery (exc. elec.)[1]	161.0	156.0	154.0
Contracts for Industrial Construction[2]	75.0[e]	73.0	157.0
Factory Production[3]	139.0[p]	138.0[r]	146.0
Consumers' Prices (cost of living)[4]	123.6[e]	123.7	121.1
Industrial Prices (materials, supplies)[4]	126.2	126.1	126.0
Manufacturing Employment (millions)[4]	15.7	15.5	16.9
Total Employment (millions)[5]	64.6	65.4	65.7
Unemployment (millions)[5]	4.1	4.7	2.6

[p] = preliminary [r] = revised [e] = estimate

Sources: 1. McGraw-Hill Dept. of Economics (1950 = 100); 2. Engineering News-Record (1950 = 100); 3. U. S. Federal Reserve Board (1947-49 = 100); 4. U. S. Dept. of Labor, Bureau of Labor Statistics (1947-49 = 100); 5. U. S. Dept of Commerce, Bureau of the Census.

Ideas of the Month

(For more information, circle item numbers on Reader Service Card next to back cover)

Litter Bug, Jr., is a new version of an old friend. This gas-powered vacuum cleaner (*Mid East Sales*), with its 24-in.-wide pick-up, is the berries for tight places, narrow aisles. Rubber-tired casters save the surface. **(311)**

Micrometer readings can be taken faster, more accurately, with Speed-Mike (*Slocomb*) because you read from a counter-type dial. **(312)**

AIMO stands for Audio Instructed Manufacturing Operation (*Dictaphone* with *Westinghouse*). It's a new method of providing taped voice instructions (instead of printed words or diagrams) to production workers. **(313)**

And COMAPRO means Cooperative Machining Project (*Cone*) or good news to multiple bar automatic users who want all the facts they can get on machinability, optimum speeds and feeds, tool life, labor, tool maintenance, overhead, depreciation, etc. The project is non-profit. **(314)**

Drum tops (*Bennett Mfg. Co.*) will convert any drum from 16¾ to 19¾ inches in diameter into a waste receptacle with self-closing top door. **(315)**

For your own private 3x5 card files, aluminum "caddies" (*Hahn Co.*) come in 6-, 9-, 12-, 18-, and 24-in. lengths. Fit desk drawers. **(316)**

Ty-Rap is a nylon tie (*Thomas & Betts*) for binding harnesses, bundles, or groups of wires. Tying time: just about 5 seconds. **(317)**

To control indoor odors, better consider a solid counteractant called Solidaire (*Airkem*). Two types—one for packaged air conditioning systems, the other for restricted areas where no air conditioners are available. **(318)**

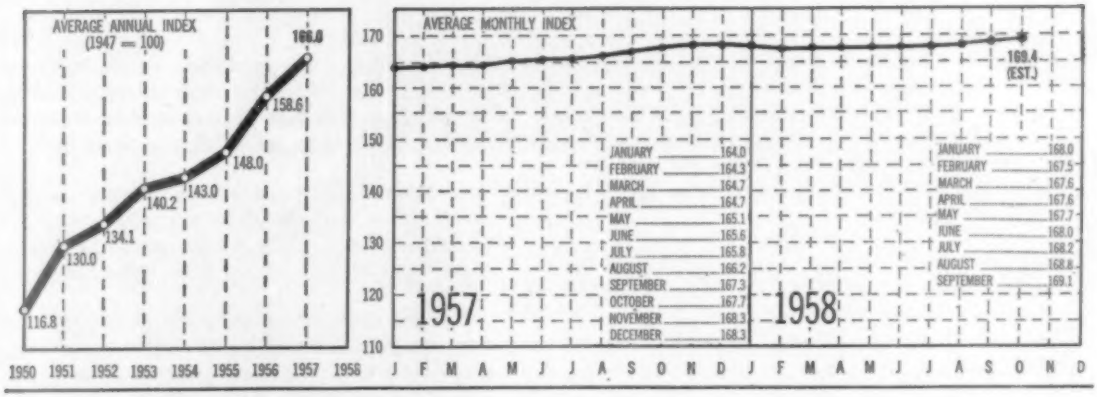
Communication in Action is a free monthly feedback bulletin (*American Management Assn.*) of cases from graduates of AMA's Executive Action Course. Based on techniques and ideas learned at the 3-week session. **(319)**

With new SS rates in effect the first of the year, your payroll people will need the new handy-dandy tax computer (*Calcu-Tax Corp.*). Shows withholding tax and the new 2½% Social Security deductions for wage brackets up to $250. **(320)**

More Ideas of the Month on pages 118 and 119

FACTORY
MANAGEMENT AND MAINTENANCE
. . . PRESS TIME REPORT • NOVEMBER 1958

Cost Index of Plant Maintenance



Cost Index Inches Up

Wage increases more than offset cut in total factory bill for materials.

FACTORY'S COST INDEX showed a slight increase in September over the month of August. The Index topped 169 (1947=100) for the first time in its 11-year history. And the 170 level is just around the corner. The latest Index is still only 1% above a year ago.

Wages are heading up. If manufacturing companies accept the auto wage settlement as a pattern for industry as a whole, there will be at least a 4% increase in wages during the next year. This year the increase has only been about 3%. However, industry can look for substantial gains in productivity or output per man-hour in 1959—more than the 4% increase in wages. This means the increase in cost of labor to the factory may be very small.

Materials prices may be expected to go up during the next few months as industrial demand gets stronger. In recent months materials prices have not shown much strength due to the slack demand from production departments. But from now on, as business activity goes up, industrial prices will move up with it.

On the average, materials prices declined in September. This was due in large part to cuts in non-ferrous metals prices and in prices of products made from non-ferrous metals. But prices of copper have firmed up in the past few weeks, so this commodity will no longer act as a brake on the upward trend of industrial prices.

With wages and materials prices both going up, FACTORY's Cost Index may top 170 before this year is over.

	AVERAGE 1957	SEPTEMBER (Preliminary)	AUGUST (Revised)
Building and Facilities Index	156.9	161.1	161.4
Materials	140.6	137.9	139.6
Brick	147.8	149.0	148.5
Elec. fixtures	128.0	128.9	128.9
Elec. switches, boards, fuses	175.7	182.6	182.6
Elec. wire, copper	136.6	123.7	123.7
Glass	152.6	152.0	152.0
Gutters, spouts, ducts	169.4	175.7	175.7
Gypsum products	134.5	140.8	140.8
Heating equipment	128.2	127.5	127.2
Lumber	126.7	128.1	126.0
Millwork	147.1	146.6	145.5
Paint	128.1	130.0	130.0
Pipe, cast iron	165.8	170.4	170.4
Pipe, steel	188.1	195.8	195.8
Pipe & tubing, copper	156.0	142.7	144.2
Roofing	129.8	108.1	121.6
Sanitary fixtures	151.4	143.0	140.0
Sash, metal frame trim	145.7	145.2	147.2
Solder	121.2	116.4	116.3
Steel, structural	222.0	236.3	236.3
Tanks, steel	138.3	137.1	137.8
Valves & fittings	159.9	162.0	161.1
Wire mesh	166.9	162.9	162.9
Labor	167.7	176.5	175.8
Carpenters	154.6	163.1	163.1
Electricians	174.5	186.6	184.6
Painters	174.0	179.8	179.8
Equipment Index	169.9	172.5	172.0
Materials	167.7	169.1	169.1
Abrasives	154.1	160.4	160.4
Alloys, non-ferrous	127.2	115.9	115.8
Bars & plate, steel	214.8	227.2	227.2
Bearings	166.2	160.3	160.3
Belting	150.9	150.0	150.0
Bolts, nuts & screws	222.9	230.0	230.6
Chain	177.6	184.0	184.0
Controls (electrical)	175.7	182.6	182.6
Gear-reduction units	180.4	181.7	181.7
Hand tools, mechanics	185.1	192.3	192.3
Lubricants	87.8	80.1	80.1
Motors	143.5	148.1	148.1
Non-ferrous metals	133.3	117.9	118.3
Precision tools	150.2	153.2	153.2
Pumps	177.2	182.7	182.7
Tools, cutting	162.3	161.0	160.5
Valves & fittings	159.9	162.0	161.1
Labor	171.5	174.9	174.0
All mfg. labor	167.5	173.1	172.2
Machine tool labor	175.4	176.6	175.8
FACTORY'S COST INDEX	166.0	169.1	168.8

FACTORY
MANAGEMENT AND MAINTENANCE
. . . PRESS TIME REPORT • NOVEMBER 1958

Looking Ahead in Labor

Labor leaders are warily eying the future—and a slow but steady encroachment on the influence and even the existence of today's powerful labor unions. This prospect has labor's tacticians working overtime on what they consider a "threat to our survival." Nub of the threat is automation. But it is really more than that.

The real threat lies in the changing workforce in America. It is the decline of the factory worker, and the rise of the white-collar and professional employee. Take the chemical industry—a forerunner, but a good example of what's happening:

Production workers in the chemical industry amounted to 525,000 in 1947; ten years later there were 538,000, a 5% rise. But in the same period, non-production workers jumped from 169,000 to 296,000—up 75%.

•

While chemical industry advances in automation are outrunning most others, all are experiencing the same trend. The production force is rapidly losing ground to the office and professional worker. Problem—for the unions—is that the latter is more often than not non-union. Machines are doing more of the production work, but more office and technical employees are required to handle the work.

Labor strategists see the problem. And the AFL-CIO's big industrial department is tackling "the impact of automation" through numerous conferences. The groundwork is being laid to avoid a downgrade in labor union power. But at this point there are more problems than solutions.

•

The main problem, of course, is to win the white-collar worker to the labor movement; otherwise the industrial unions will be outstripped by the non-union employees. "If we are unable to organize these non-production employees in some form," says one union official, "we not only reduce our economic strength, but we also reduce our political strength." And, he warns, "As our production workers go down in size, as we fail to organize the office and clerical employees and the technical and professional employees, any role that unions play in small-town politics begins to slip."

The strategists are agreed that for the big auto, steel, paper, and other unions to maintain their influence, non-production workers must be organized. But they don't agree on which way to do it:

. . . *Form separate unions with "almost a professional flavor"* to appeal to the white-collar and technical workers. This would mean new unions, rather than aligning with present industrial giants.

. . . *Give professional and office employees separate locals,* representation on international union executive boards "with some clear-cut psychological and actual recognition of their status. (The United Auto Workers are already moving this way.)

. . . *Integrate white-collar workers into existing unions.* Proponents of this move hold that separate unions or divisions won't work. "Economic power is basically organized along corporate lines, and the white-collar worker will have to join with his brother workers in the factory to be truly effective." This proposed solution involves unions paying more attention to vocational training, retraining, and licensing procedures.

For you, any of these "answers" to the automation threat mean union concentration on the non-production worker. He's the key to labor unions of the future, and labor unions of today know it.

•

Sign of the times: The recent convention of the AFL-CIO Chemical Workers Union offers a capsule picture of today's trend. In an industry of historically divided bargaining between many unions and many companies, the chemical union has made a big jump to the future.

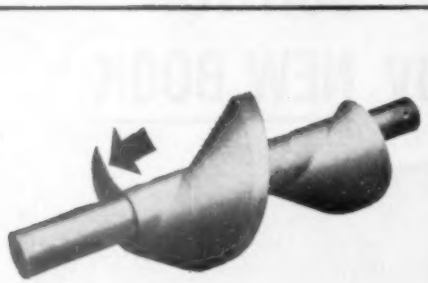
Union President Walter Mitchell rode into the convention on a platform of company-wide bargaining and merger with another giant—the Oil, Chemical, and Atomic Workers Union.

The results, after some substantial debate: A shift to the new pattern. Mitchell's union backed him in giving the international more bargaining authority and an OK to talk merger with the Oil, Chemical, and Atomic Workers Union. Could be one of the first ripples that will form the wave of the future.

SEE LABOR RELATIONS NEWS, PAGE 192

New turning idea is born...

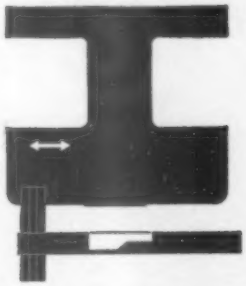
LeBlond Engineers turn trick with tracer

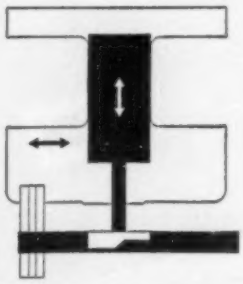


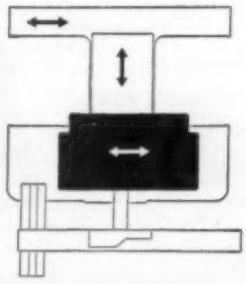
1. Problem workpiece—spiral rotor for pumps manufactured by Roots-Connersville Blower Co., Connersville, Indiana. Shaping just couldn't produce the wide variety of exact contours their engineers wanted. Could rotors be *turned*—automatically?

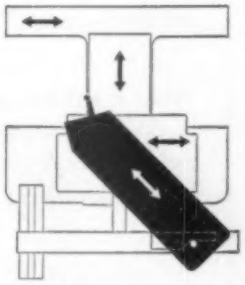
2. Why not? With special end gearing and full nut, we can "chase" the spiral shape like a coarse thread. That's easy . . . the problem is the contour.

3. We'll use Hydra-Trace to *position* the tool (not to trace). We can mount a special length slide on the cross slide to give us feed *between* cuts.







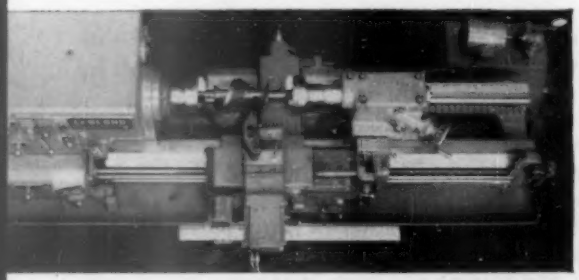


4. Let's see how this looks in plan. The carriage provides length motion for the tool. The template carrier moves lengthwise with the carriage.

5. The cross slide gives cross travel plus automatic tool relief. The template carrier also moves "in and out" with the cross slide.

6. The special length slide gives us feed. Not continuous feed. Just tool-positioning feed that moves the stylus along the template for each successive cut.

7. The template controlled Hydra-Trace positions the tool to produce the contour. During the cut, no feed takes place. Only the chasing action.



8. Here's the finished machine—the LeBlond Contour Chasing Lathe, basically a 32″ Standard Duty. Modifications include: special end gearing, full nut, special length slide, automatic cycling and special heavy duty reversing electrics. Lathe chases leads from 4½″ to 16″.

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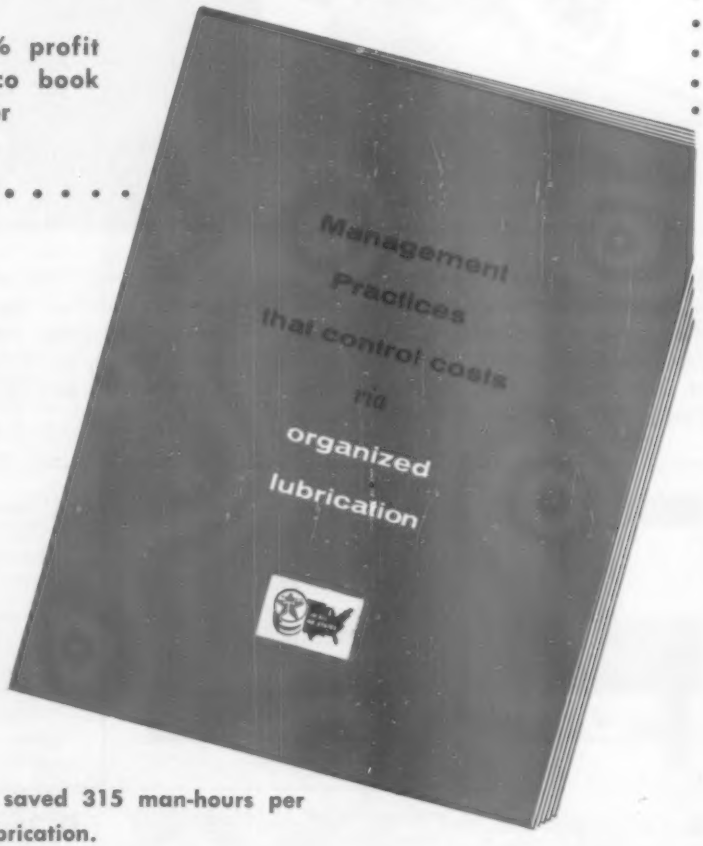

Why you need it: The Texaco guide uncovers a new area where management can effect real economies in reduced maintenance costs. This is especially important now that decentralization and generally lower profit margins make the profit-and-loss statement the real measure of each plant unit's management efficiency.

What it will tell you: With facts like these, the Texaco guide shows that organized lubrication can raise production, extend parts life, and cut downtime:

★ A metalworking manufacturer saved 315 man-hours per month through more efficient lubrication.

★ A major corporation anticipates substantial maintenance savings through the services of a lubrication engineer.

★ A mill has increased bearing life from 16 to 72 shifts by instituting systematic lubrication that insures the right lubricant for each machine.

How it will help you: Only organized lubrication gives management such an opportunity for savings. For example, a 10% reduction in maintenance costs through better lubrication methods will increase profits up to 4% in the average plant—more than equivalent to a 4% increase in sales. And Texaco's new guide shows how it may be done.

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PLAN '59

How Modern Is American Industry?

A Report by the McGraw-Hill Department of Economics

THE U.S.A. is starting a new period of economic growth, as we leave behind the recession of 1958. This new period presents a challenge to the nation, to the business community and above all to the individual company – to grow *at a profit*.

By now it is clear that growth is the normal way of life for the U.S. Economy. Since 1947, our national product has been growing at a rate of 3.7% a year. And no recession, even the latest and most publicized, has interrupted the trend for long. Now the economy is growing again.

But the conditions of growth are far different from those that prevailed in the years 1947 to 1957.

Today growth in the economy does not mean pressure on capacity, for most industrial firms. It does not mean easy profits. Rather, this is growth under highly competitive conditions, with profits dependent on a firm's ability to hold down costs. **Is our plant and equipment modern enough to do the job?**

A New Survey

To find the answers to this question, the McGraw-Hill Department of Economics has just completed a special survey of business needs for modernization. **The survey shows that it would cost $95 billion to replace today's obsolete equipment.** And this is a priority job, if business is to get costs down for the years ahead.

This tremendous need for modernization presents a challenge to the U.S.A. as a nation. The Communist powers are making a strong and disciplined effort to demonstrate that they can out-produce us – that they can "plow us under" in a contest of industrial strength.

It is a challenge to American business. Our people expect a continuously rising standard of living. Our workers expect wage increases. And often their demands mean price inflation – unless we can achieve sharp gains in output. The public demands higher national income without inflation. This is the challenge to business as a whole.

It is a challenge to the individual firm. Growth in the economy no longer means an automatic rise in sales and profits for any particular company. There are no shortages; industrial capacity is ample. So to participate in growth, the individual firm must achieve better quality or lower costs than its competitors. Otherwise, there will be no profit in growth and no success story for the company.

Is business prepared today for these challenges? The answer, from our study, is clearly "No". The production and distribution facilities of the U.S.A. are not efficient enough to ensure our continuing superiority over the Communist world, to match every wage increase with higher productivity, to do business in a competitive economy at satisfactory profit to the individual firm.

This statement sounds shocking at a time when much industrial capacity is idle and the recession just behind us is being blamed on a surplus of capital goods. But the facts speak for themselves. Here is the record on the past decade of investment in new plant and equipment, and here is our new study of the job that still remains to be done.

THE MODERNIZATION JOB AHEAD: $95 BILLION

The McGraw-Hill Department of Economics asked a wide sample of manufacturing companies, and experts in other industries, "What would be the cost to replace all obsolete facilities with the best new plant and equipment?" Here is a summary of the estimates. (Details on next page.)

MANUFACTURING AND MINING	$34.3 Billion
PETROLEUM INDUSTRY	5.3
TRANSPORTATION AND COMMUNICATIONS	18.4
ELECTRIC AND GAS UTILITIES	12.0
FINANCE, TRADE AND SERVICES	25.0
TOTAL: ALL BUSINESS	$95.0 Billion

Decade of Expansion[1]

Since 1947, private business in the U.S.A. has invested $291 billion in new plant and equipment. Our manufacturing capacity has increased about 80%; electric power capacity, 145%; capacity for basic raw mate-

[1] Figures on "Decade of Expansion" are for the years 1947-1957 inclusive, except where specific reference is made to preliminary data for 1958.

THE McGRAW-HILL SURVEY OF MODERNIZATION NEEDS

Conducted by the McGraw-Hill Department of Economics in August, 1958

INDUSTRY:	AGE OF MANUFACTURING CAPACITY Percent Installed: Prior to Dec. 1945	Dec. 1945 to Dec. 1950	Dec. 1950 to Dec. 1957	COST TO REPLACE OBSOLETE FACILITIES: Millions of $
Iron and Steel	47%	16%	37%	2,855
Nonferrous Metals	47	13	40	1,022
Machinery	41	21	38	3,224
Electrical Machinery	34	18	48	1,917
Autos, Trucks and Parts	42	11	47	2,204
Transportation Equipment (aircraft, ships, railroad equipment)	59	9	32	854
Other Metalworking	54	17	29	2,351
Chemicals	30	23	47	3,070
Paper and Pulp	49	17	34	2,655
Rubber	46	9	45	600
Stone, Clay and Glass	46	20	34	1,840
Petroleum Refining	45	26	29	1,499
Food and Beverages	58	19	23	3,443
Textiles	59	18	23	1,001
Misc. Manufacturing	51	21	28	6,236
ALL MANUFACTURING[1]	48	19	33	34,771

[1] Includes petroleum refinery companies listed under "petroleum industry" in previous table.

rials, by 55%. The distribution and service industries have increased floor space by roughly 50% in the decade. In 1957 alone, business spent $37 billion on new plants and equipment – more than the combined expenditure in all of Western Europe plus Canada.

But all of this expenditure has not made our facilities as modern as supposed, or as modern as we need. Of the $291 billion invested by business since 1947, roughly $157 billion has been for expansion of capacity. Only $134 billion has been spent to replace old facilities with better, more modern equipment. And in recent years, this investment has not purchased as much new equipment as the dollar figures suggest, because prices of capital goods have climbed.

Our postwar capital investment has repaired the worst of the obsolescence accumulated during the depression and war years. But huge amounts of old equipment are still in use, as shown by the table above. This is based on a survey of the age of manufacturing capacity in several hundred companies, representing all of the major manufacturing industries. Almost 50% of our present capacity was installed before or during World War II. More than 65% was installed before Korea. Expert studies of the major non-manufacturing industries show that the age of equipment, in those industries, is even greater.

Thus, of all business plant and equipment, less than one-third is modern in the sense of "new" since 1950; two-thirds is pre-Korea.

This over-all figure is confirmed by a check on specific industries:

- Nearly two-thirds of our metalworking equipment was installed over 10 years ago, according to preliminary results of AMERICAN MACHINIST'S 1958 census.
- Over 65% of the freight cars on our railroads are more than 10 years old.
- Less than half the capacity to process chemicals, rubber or petroleum is new since 1950 – a period that has seen rapid development in such equipment as automatic controls for these process industries.

These examples take on a dollars-and-cents meaning when we recognize that the latest machine tools are about 40% more productive than 1948 models, and that a combination of new freight cars and modern freight yard equipment can reduce operating costs up to 50%. New instruments, that automatically direct the flow of a chemical (or other raw material) process, can often reduce processing costs enough to pay back the cost of the instruments in one year. These savings cannot be made in older plants. By using obsolete facilities, our industries accept a waste in labor and materials that totals many billions of dollars per year.

Why Productivity Must Rise

The U.S.A. can ill afford this waste. In the economic struggle between the free world and Communist world, our margin of superiority depends on the efficiency of our productive facilities.

For the growth of our own economy, we shall need a sharp rise in productive efficiency. During the next ten years, American business must provide the goods and services required for a population that will increase by 32 million. And the increased population will expect higher living standards. Furthermore, the population in ten years will include a higher proportion of dependent persons – children and retired people – and a smaller proportion of working age men. Thus, with a relatively smaller labor force, industry must provide more goods for more consumers.

At the same time, industry must strive to hold the line against rising costs. In an economy with a tight

labor supply, we cannot count on restraint in wage demands, however desirable such a development might be. In the past ten years, hourly wage rates have increased over 5% per year, nearly twice as fast as output per manhour. And this disparity may well continue – causing still more inflation–unless we make more rapid gains in productivity.

We can make these rapid gains – if industry goes all out to modernize its equipment. Output per manhour (in manufacturing) has increased only 2.5% per year since 1951. But this compares with gains of 4% a year in 1947-1950, and over 5% in the 1920s. Today the machines and techniques are available for us to equal, or exceed, these records – to raise output per manhour at least 5% per year. This is a job that can, and indeed must be done, to assure growth in the economy without inflation.

The Job Ahead

The dimensions of this opportunity are shown by the table on the previous page. In its survey on the need for modernization, the McGraw-Hill Department of Economics asked a wide sample of manufacturing companies how much it would cost to replace *all* their out-dated facilities with the best new equipment available. The Department also interviewed experts in each of the nonmanufacturing industries, to find answers to this question. The answers add up to a staggering bill for new plant and equipment.

Modernization of over-age facilities – replacing only what is really obsolete, by today's production standards – would require a total capital investment of $95 billion, or nearly $20 billion per year for the next 5 years.[1]

Furthermore, new production techniques will soon make *today's* plants obsolete, in many cases. Thus, to keep pace with technical advance *from 1958 on*, will require continuing expenditures of $8 to $10 billion per year for modernization.[1]

The total expenditure to wipe out the backlog of obsolete facilities, and keep up with continuing technical advance between now and 1963, would be at least $135 billion.

The U.S.A. has never spent such a sum on the modernization of industrial facilities. Capital expenditures of boom dimension have, in the past, been associated only with the urgent expansion of capacity. **Some forecasters are now saying that because industrial capacity is adequate, the next few years will be a period of low capital investment. The figures above make clear that this would be a national calamity.** The opportunity is there–and the challenge–to invest record amounts of capital in the modernization of plant and equipment.

A National Problem

This also is a challenge to the U.S.A. as a nation. For 100 years, this nation has been looked to as the model of economic development by the rest of the world. For the first time, we face a serious challenge by another nation and another economic system that claims to be better. In a carefully documented 111 page study released in May, the U.S. State Department declared that "the most serious threat" to the U.S.A. today is the drive for economic supremacy by the Soviet Union.[2] Although a much smaller nation industrially than the U.S.A., the U.S.S.R. is today increasing its national output at a rate of 7% per year and its output per manhour by 4% per year.

The U.S.A. does not have to match these specific figures, which represent the results of forced labor in a country just starting to develop industrially. In the contest to win uncommitted nations, the statistics are not likely to be quoted exactly, in any case. But our over-all growth in national output and living standards must be so impressive as to leave no question of superiority. Our factories must be showplaces of modernization to the foreign visitor that will leave him unable to say "I saw much better" in Britain, or West Germany, or Russia.

This is the challenge to the nation –a political challenge to be sure. But it coincides with the challenge to the business community and the individual firm. And the way to meet it is the same: by thorough and rapid modernization of our plant and equipment – not by the slow and steady pace of recent years, but at an accelerated rate that reflects the greater pressure for output at lower cost.

Obstacles To Be Overcome

We must face up to the fact that real obstacles – both technical and financial–stand in the way of faster modernization. Some companies do not have the technical "know-how" required for the latest production techniques. Many more lack the financial resources. How can we overcome such obstacles, and speed up the replacement of old facilities?

In the course of its study, the Department of Economics obtained comments on these questions from many executives. One of the problems, as we noted above, has been the urgent pressure to expand capacity during most of the postwar period. In giving their attention to this problem, companies have sometimes overlooked the chance to modernize older plants.

In some cases, equipment has been kept in place because it was satisfactory, and the users were not aware of still newer designs. Some equipment users believe that equipment makers are not sufficiently aggressive in designing and demonstrating new models.

The biggest obstacle – and one that presents a persistent problem – is the shortage of funds in many companies that need and want to modernize. For all corporations, the cash flow from retained earnings and depreciation has increased by more than $5 billion from 1953 to 1958. But a number of key indus-

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[1] This estimate is based on technical developments reported by McGraw-Hill editors and current price trends for capital goods. It is consistent with the plans for modernization expenditures in 1958-61 reported by companies in a McGraw-Hill survey conducted in April, 1958.

[2] "The Sino-Soviet Economic Offensive in the Less Developed Countries" – U.S. Department of State, May, 1958.

MODERNIZATION PAYS

Profits on modernization—like all business profits—have come down since 1955. However, modernization, in contrast to new capacity, still offers a relatively quick return on investment. Here are companies' answers to the question: "In cases where you are actually replacing old facilities with new plant and equipment in 1958—how soon do you expect these replacement expenditures to pay off?"

	PERCENT OF COMPANIES ANSWERING			
INDUSTRY:	1 to 2 yrs.	3 to 5 yrs.	6 to 8 yrs.	9 yrs. and over
Iron and Steel	11%	56%	11%	22%
Nonferrous Metals	29	71	0	0
Machinery	12	56	12	20
Electrical Machinery	29	57	7	7
Autos, Trucks and Parts	40	60	0	0
Transportation Equipment (aircraft, ships, railroad equipment)	7	53	20	20
Other Metalworking	38	33	10	19
Chemicals	10	53	21	16
Paper and Pulp	22	22	22	34
Rubber	33	33	34	0
Stone, Clay and Glass	0	57	36	7
Petroleum Refining	16	50	17	17
Food and Beverages	16	44	12	28
Textiles	37	47	5	11
Misc. Manufacturing	9	52	13	26
ALL MANUFACTURING*	18	50	14	18

**Note:* Answers to a similar question, in a 1955 McGraw-Hill survey, were as follows: 1-2 years: 17%, 3-5 years: 64%, 6-8 years: 11%, 9 years or more: 8%.

tries have failed to keep pace with the general trend. **These include some of the areas where the need for modernization is most urgent: the railroads, large sections of the textile industry, some mining industries and many small to medium-size companies in manufacturing generally.** The problem of these industries and companies has grown more acute in 1958 – since their profits have declined much more than the average for all business.

Any plan to step up the pace of modernization generally must deal with the special situation in these problem areas. Depressed industries and companies need outside help, if they are to modernize. Such help would include a stronger flow of technical information and advice (and occasionally, venture capital) from the more prosperous, inventive industries – as well as advice from equipment suppliers and distributors, industrial publishers and consultants. There is also a public responsibility to help in the problem areas—not with handouts of government money, but with technical assistance and help in finding private capital (like the efforts now being pursued by the Small Business Administration).

Certainly we should lose no time in reforming those provisions of the federal tax laws that now impede investment in modern equipment by hard-pressed firms – especially the outmoded and unfair restrictions on rates of depreciation for tax purposes. At present, the tax regulations require that depreciation be computed over relatively long periods of "useful life" for most types of equipment. And this is a primary reason for the lag in modernization. Machinery generally becomes obsolete long before the expiration of its "useful life" as specified in tax regulations. But it is difficult for companies – especially small companies – to set aside cash for rapid replacement, unless the full amount to be set aside is exempt from income tax. Canada and most European nations allow more rapid depreciation for tax purposes than does the United States.

A combination of self-help with technical help, and a fair break from the tax laws, would do much to reverse the spreading tide of obsolescence in depressed industries, and in many small companies.

PLAN '59

It is this combination that McGraw-Hill advocates as "PLAN '59", to help business modernize *now* for growth and profits. This is what it will take to make a start in 1959 on the $95 billion job of modernization, disclosed by the study we have just completed:

1. A better flow of technical information on where and how to modernize business plants and equipment.

2. Careful review by the individual company of its own opportunities to modernize at a profit – then action to replace obsolete facilities.

3. Reform of the tax laws, to allow more realistic deductions for depreciation, and permit more companies to finance adequate modernization programs from this source of funds.

Much of this program is already underway. The 34 McGraw-Hill Publications, and many suppliers and distributors of industrial equipment, have stepped up their information programs to start the modernization drive. Preliminary plans of manufacturing companies show a strong emphasis on capital spending for this purpose. In August, Congress passed a bill providing limited tax relief for small business.

But the real task of modernization still lies ahead. It is the greatest challenge, and the greatest opportunity, confronting American business as we move forward into 1959.

FACTORY'S GUIDE

TO

MANAGED MODERNIZATION

What "Managed Modernization" Means

It doesn't mean any one thing. It means many things. It all adds up to a new attitude for running your plant. It has these urgent implications for you:

- **It's a concept, not a procedure.** That means you can never stop and say, "The job is done. We're up to date." You'll find the reasons for this concept in "Why Managed Modernization Makes Sense Today," page 80.
- **It's systematic, not hit-or-miss.** You'll see how to set up your own fact-gathering network in "13 Idea Sources on Modernizing," page 82.
- **It's balanced.** It enables you to give a fair shake to every phase of manufacture. For help in surveying obsolescence in your plant, look at "FACTORY's Obsolescene Audit Guide," page 84.
- **It's geared to customer demands.** It requires plant operating managers to step up their thinking to broader management levels. You'll find plenty of help in "Return on Investment: Toughest Measure of a Manager," page 90.
- **It's easy to get started.** Quickly, with your existing organization, without spending extra money. For ways to loosen resistance, see "How to Sell Modernization Ideas Up the Line," page 100.
- **It's hardboiled but fair.** Emphasizes need for decisions based on fact and merit. Gives financial perspective in "Winning an Okay From Money Men," page 105; establishes dollar values in "Cost Comparisons You Can Trust," page 156; examines alternatives in "Lease or Buy," page 200; insures success in "Four Tips for Your Follow-Through," page 216.
- **It's practical.** You'll see how practical when you run through this month's Plant Operating Management Case Book—16 pages of case histories of modernization at work. Starts on page 139.

All this takes a lot of doing. To make it easier for you, FACTORY added to its annual hundreds of plant interviews 81 special interviews with plant operating executives and top financial officers in 54 plants on how to raise industry's modernization IQ.

In over 58 pages in this issue we'll tell you about some of the successful tools that anyone can use to upgrade his modernization IQ. So, if you'd like to raise yours . . .

. . . turn the page

PLAN '59

MANAGED MODERNIZATION

Your most urgent job for 1959: Modernize for growth and profits. Your best procedure: Plan it, see it through. Here are 10 solid reasons . . .

Why Managed Modernization Makes Sense Today

THE COMMENTS in the panel (facing page) make a powerful case for the need to modernize. They are typical of the reactions of the many operating management men FACTORY's editors have interviewed in the past few months. They represent the thinking of men like *you*, the men who run the plants of America.

Here, summed up, are *their* explanations of why managed modernization makes sense for *you*—right now.

1. It's in tune with the economic times. The trend is markedly toward modernization of existing facilities rather than expansion of capacity through building new plants. Our McGraw-Hill Economics Department's surveys show that about two-thirds of all capital spending will be for modernization by 1960.

2. It enables you to take full advantage of the most opportune buying times. Such as now, when you can still get faster service, better engineering attention, and better prices than when a full-scale boom is under way (as it will be shortly). Then all the hit-or-miss modernizers will be begging for deliveries at any price. They've done it before. They'll do it again.

Is anybody doing it the smart way? You bet. Listen to a man whose modernization program gives him flexibility to grab opportunities to buy advantageously: He's T. R. Dreyer, vice president, Brooklyn operations, American Machine & Foundry Company. He says:

"Each year we have a capital equipment expenditure budget for the next. But this year we've prepared an addition to the 1958 budget. We feel that now is a particularly good time to buy equipment because of price and delivery advantages. We're hoping an increase of $500,000 will be approved."

3. It's about the only good weapon left against constantly rising labor costs. You can't knock average hourly rates down (up in the past five years by 25%, going up more even in a recession year). But you can knock the spots off *unit* labor costs with heavy emphasis on mechanization in your modernization plans.

To limit this emphasis to direct labor can be a mistake. There's plenty of evidence that the biggest returns today may come from concentration on indirect functions like materials handling, production and inventory control and maintenance.

Rockwell Manufacturing Company offers an excellent example of what can be done by attacking indirect labor costs as a key element of its continuing modernization activity. Three years ago over 90% of its industrial engineering effort was going to reduction of direct labor costs. Today only 50% goes to such work. The other 50% is spent on indirect. Result: Rockwell plants are coming up with one dramatic improvement after another, ranging from new toolcrib systems to mechanized production control paperwork to automated handling for fabrication operations.

Says Ralph Day, Rockwell's chief industrial engineer, "Attacking indirect labor areas often leads to reductions in direct labor costs, too. We've had cases where direct labor went down 30% to 40% when we dropped indirect by approximately the same amount."

4. It helps you keep in step with the increasing complexity of manufacturing technology. The more complex technology becomes, the more vital it is to be systematic and planful in reviewing equipment, processes, and facilities for signs of obsolescence. In fact, a vital element of managed modernization is keeping up with technological change. To see how companies are licking this tough problem, see p. 82.

5. It helps reduce the risks involved in today's heavy capital spending. This is important because the amounts of money required for modernization are much bigger than even a few years ago. A measure of this is number of dollars invested in plant and equipment per employee. Figures compiled by the National Industrial Conference

By M. J. MURPHY, FACTORY

What Plant Management Men Say About Managed Modernization

"We hate it when we have to replace a worn-out machine simply with a later model of the same. If we've been doing a job the same way for ten years, we must be behind the times"—Vice president of manufacturing, heavy machinery.

"Process obsolescence comes about much more rapidly than any one thought it could a few years ago. We see many a unit that was projected for 15 years being replaced after 5 or 6"—Chief project engineer, pharmaceuticals.

"If our plants aren't obsolete in 15 years, research isn't doing a good job"—Manufacturing vice president, foundry.

"The chemical industry, and our company in particular, is more aggressive than other industries. We're constantly spending to create obsolescence. We feel competition very keenly, and, of course, heavy cost-improvement pressures" —General plant manager, chemicals.

"Up to five years ago we modernized by the seat of our pants. Then competition began to kick us in the pants" —Division works manager, gears and gear drives.

"You can hardly expect people to work to close tolerance if they have to use broken-down toilets. The same is true of the old machine tools we used to have in our shops. How can you expect a man to do a really responsible job when you show him how little you think of the work he's doing by letting him use 40-year old lathes?"—Works manager, process machinery.

"The plant is less than 15 years old, and most of our production is done in areas that are six years old or less. Yet we keep at the job of modernizing these facilities every time the opportunity presents itself"—Manufacturing vice president, cameras.

"I think modernization means that we have to keep strong competitively by any means necessary"—Chief industrial engineer, printing.

"We believe that to remain in *status quo* is going backwards. We know we must keep improving everything. What you call modernization, we call cost reduction"—Assistant general manager, metal alloys.

Board show that the investment rose from $7081 in 1946 to $13,157 in 1954, the latest year for which figures have been published.

When even small companies have to talk in terms of hundreds of thousands of dollars, careful modernization planning begins to look like the only sensible course. The stakes are too high to take unnecessary risks. And, looking at the other side of the coin, the risks of failure to do the best possible thing loom larger in terms of loss of business as well.

6. It fits neatly into the current big trend toward long-term planning. This has been one of the most striking findings of the McGraw-Hill capital spending surveys. Ten years ago, when the surveys were begun, a company that could look ahead as far as three years was a rare find. Today, over 90% of all companies surveyed plan three years or more ahead.

With look-ahead thinking obviously growing, hit-or-miss modernization planning can be really harmful.

The record for long-term modernization planning among plants visited by FACTORY's editors is held by a New England plant that has a successful 15-year facilities and equipment improvement plan in effect. The plan is reviewed annually and in effect is a perpetually extending project, always looking ahead for the next 15 years. A good half of all companies visited looked ahead five years. The big flaw in many of these plants lay in the fact that they didn't have an organized basis on which to do their looking ahead.

7. It helps reduce conflict and friction among operating management men. The struggle to see who will get the lion's share of the money available for improvement can be bitter when there are more projects than dollars—which is often true. Too often the most persuasive executive gets money that might better be spent elsewhere. Or there's politicking or compromising unrelated to the project's merit.

Here's where managed modernization pays off big. Because there necessarily must be a thorough appraisal of the needs of *all* phases of the operation, it is much easier to establish priorities on an objective basis. And every operating executive is assured that his requirements have been considered in the light of the total needs of the organization. Hence, less bickering, less jealousy, less friction.

8. It gives higher management executives more positive assurance that the company's money is being spent most wisely. And, as an important corollary, it thus makes it easier to sell important projects to them.

The production manager of one plant in a medium-sized multi-plant chemical company puts it like this: "The big proposals (over $50,000) have to go before the full board of directors. When my boss tells them the job is part of our master plan, the only thing they ever do is fiddle around with the wording of the proposal. We don't mind that. It gives them something to do, and we get what we asked for."

9. It has important internal effects on rank-and-file employees and supervisors. This point is repeatedly made by companies that have had experience with planned modernization. It's evidence the company is on the ball. And it stimulates morale, improves cooperation, and (with even a little encouragement) leads to a good flow of improvement ideas.

10. It has important external effects. Here several were mentioned by plant operating men in our interviews: . . . The news adds up to good public relations, helps improve number and quality of job applicants . . . Stockholders love it . . . Bankers are impressed with planful modernization, more readily part with money when a company has to borrow . . . And customers are impressed, too, especially where your company serves industry rather than the retail consumer market.

PLAN '59

MANAGED MODERNIZATION

You need a technological intelligence system to know what to modernize—and what to do it with. Here are . . .

13 Idea Sources On Modernizing

ONE PRIME IDEA SOURCE FOR 20,000 PLANT

"A MACHINE isn't necessarily obsolete because it's old," says Joseph Martin, president, Sun Tube Corporation (Hillside, N.J.). "It's obsolete—regardless of age, when it can be replaced, modified, or rebuilt to produce savings for the company."

Martin's definition frames a large problem in modernization: To determine what's obsolete. One part of the problem is to analyze your present facilities and equipment in terms of what's available to replace them. Another part involves viewing your functional needs independent of present plant components (facilities and equipment). You'll read about all this in FACTORY's obsolescence audit guide (page 84).

How do you spot your best modernization targets? FACTORY asked that question of 81 plant men. We found that few do a really sophisticated job of determining their best in-plant candidates for a modernization study. Many frankly admit they have no system at all. But most of them do have some system to help them focus on questionable plant components.

Here are 13 pointers from plant men on how to get obsolescence data and make the information work. These pointers break down into four internal and four external indicators, and five new-idea sources.

FOUR INSIDE INDICATORS

These are survey results, vital record data, maintenance records, and production problems. Here's how you can use them to spot modernization needs:

1. Survey results—Quarterly, semiannually, and annually plants make surveys and call for obsolescence reports from departments. Take Vapor Heating Corporation (Chicago), for example. Every year the general plant manager, tool engineer, and department foreman tour each department, analyze every piece of equipment. At one eastern company supervisors submit a report of modernization plans and progress every three months.

Raybestos Division of Raybestos-Manhattan Corporation (Stratford, Conn.) uses the results of three surveys: Operating heads study facilities, make a list of modernization objectives; and industrial engineering and methods departments make their own surveys and lists. Finally the three lists are merged. Items are given rough priority for study and subsequent recommendation.

And here's a bonus idea. Nobody happened to mention it in our survey—but we think this is a good place to use an alert consultant. Let him make a survey of plant components, suggest items to study.

2. Vital record data—The age of a machine isn't always a valid indicator of obsolescence (as Mr. Martin points out earlier). But it can be a tip-off to watch the equipment more carefully.

Procedures vary with different plants. Some begin to look at equipment more closely when its age in years reaches a pre-determined point. Others sharpen their focus when machine-hours exceed an established minimum. Point is, actual usage isn't necessarily the same for all machines purchased at the same time. Some may operate three shifts, others only one.

Most popular signal seems to be depreciation life. When, for tax purposes, a machine is about to be written off, the managers of a large electrical manufacturing company watch it closely for signs of inefficiency, opportunity for improvement.

3. Maintenance records—Most plants use these to help identify their sensitive components. The records contain cost figures for downtime losses and actual maintenance work. And often the records aren't for machines and equipment alone. A roof, for instance, can be as big a maintenance—and as much worth a record—as a machine of the same replacement dollar value. A window-sash painting bill may be more than the maintenance cost of your most troublesome conveyor.

Want some rule-of-thumb figures? Here are some we picked up. They may surprise you. One company figures it's time to replace when annual maintenance cost reaches 25% of the cost of replacement components. And the figure goes as low as 5% for toolroom equipment, 10% for light production equipment.

4. Production problems—They're an obvious tip-off on obsolescence. Quality, time, and cost problems are

By G. A. HOY, FACTORY

OPERATING MANAGERS: THE 1958 PLANT MAINTENANCE & ENGINEERING SHOW.

signs of aging. And in today's headlong product-development climate problems come faster than ever. Aircraft manufacturers that FACTORY visited have no formal obsolescence audit system. Reason: Not needed, because the product changes so fast that tools, facilities, and methods are constantly being changed.

FOUR OUTSIDE INDICATORS

The internal indicators (above) are meaningless until you relate them to the replacement possibilities available. For example, there's little basis for decision in a sky-high sash-painting bill if you're not familiar with the merits of modern maintenance-free window sash. For this kind of information there are four indicators:

1. Outside contacts—Standard Pressed Steel Company (Jenkintown, Pa.) sends its plant men to shows and plants all over the nation and overseas. "It's the only way we can keep abreast of what's new," says Purchasing Director John Moorhouse. Same is true of Diamond Alkali Company (Cleveland). "Our operating men keep abreast of the status of our equipment by comparing its performance and cost of operation with any other similar facilities available. We visit other company plants, other non-competitive plants in our field, other plants in related industries," says R. C. Cutter, director of engineering. And these are only examples.

2. Trade and business literature—You're reading one of your best updaters right now (FACTORY, that is). "We get ideas from FACTORY and similar sources," says W. Harvey Thompson, vice president and general manager of H. K. Porter Company's Riverside-Alloy Metal Division (N.J.).

The editorial pages aren't the only places to look. Advertisements, too, offer useful information.

3. Visitors and salesmen—Strangers tramping through your plant can be a nuisance. Or a tool for progress. Depends on how you look at them. The visitor, even a top competitor, might have plenty of excellent ideas if you take time to walk through with him.

Salesmen, too, can come up with bright ideas that stand the test of careful investigation. Often a salesman suggests money savers that aren't related to his own product. He's in a different plant every day, has a perfect opportunity to see the latest methods and hear practical evaluations of them.

4. Your competitors—If there's a more pressing reason than competition for swinging your weight behind a modernization objective, we don't know it. But, as one interviewee pointed out, it's a dangerous route to take without checking. Your competitor can be dead wrong. So be quick to get on your competitor's bandwagon—but avoid duplicating his mistakes.

FIVE NEW-IDEA SOURCES

They can contribute really usable obsolescence information and remedial steps for plant management. Here they are:

1. Reports, conferences—You're just back from a show—full of new ideas. It's the time to call a staff meeting, pass your experiences on, give others a chance to relate the new ideas to your operation.

Or you've just read an article you think is terrific but you see no immediate application. Pass the article on. Somebody else might see the light.

2. Your top brass—The chairman of the board reads a lot, visits a lot. If he's seldom in your plant, escort him through oftener, get him to talk.

3. Your workers—Most common way to get workers to contribute to plant improvements is through a suggestion plan. Make sure there's fast-answer feedback.

4. The growing men in your plant—Nothing will cause a line supervisor to give all he's got more than responsibility for cost in his own department. The more responsibility you give him, the more he'll look for better methods.

5. Your own cost reduction program—A continuing, integrated cost reduction program is a prime source of modernization ideas. That means equipment reviews, work simplification, brainstorming—all the techniques of better methods operating on a continuous, scheduled basis. If you want to start such a program, you'll get the help you need from FACTORY's August 1957 issue.

PLAN '59 MANAGED MODERNIZATION

To keep modern you've got to track down the obsolescence in your plant. Need help? Here's FACTORY's brand-new concept of . . .

How to Audit Obsolescence

HERE'S A NEW APPROACH to a technological obsolescence audit based on the performance of functions and services required to turn out the right quality and quantity of product in the time available.

This is a compromise between the extremes of a complete systems analysis (box, page 89) and a simple review of new models of equipment now in use.

The key point in auditing on the basis of functions and services required (preferably by studying engineering drawings and operation sheets) is that it provides an effective means of checking *process* or *methods* obsolescence as well as *equipment* obsolescence.

FACTORY's audit form (at right, with a hypothetical example worked out) is designed to be used with the functions-and-services approach. But you can also use it for a simple equipment review.

The 8-step outline (below the form) makes this approach sound simple. The procedure *is* simple. But it takes common sense, an awareness of some traps and pitfalls, and some hard work. Since it is new, chances are it will also require modification in the light of actual experience in various situations.

Perhaps the most obvious question involves making the methods audit (Part I of the form) without getting bogged down in equipment. Certainly you must know sometime about the equipment that might be used with the various methods. But you won't need a great amount of detail at this time—just assume the equipment that you suspect would be best for the method.

So that you won't short-change yourself, always include in the methods audit what you suspect is the best equipment for performing the function by your present method. This will provide a sound audit of the method, even though present equipment might be sadly inadequate—as turns out to be the case example.

In rare cases, selection of a method will dictate a specific piece of equipment. More often, you'll have

By CARROLL W. BOYCE, FACTORY

HOW FACTORY'S NEW

JOHN JONES MFG. CO.

Technological Obsolescence Audit

A: JOIN OR ASSEMBLE
(function or service performed)

B: SIDES AND BOTTOM OF METAL BOX 12x8x4 INCHES
(parts or materials)

PERFORMANCE FACTOR	RELATIVE VALUE WEIGHT
1. Acquisition and installation cost	4
2. Space required, including area for operator, stock, and service	2
3. Production rate	10
4. Flexibility for major change in operating specifications, performance, or rate	1
5. Ease of adjustment for minor change or correction	5
6. Amount of adjustment required in normal operation	7
7. Ease of operation (skill, training, and availability of operators)	8
8. Ease of maintenance	8
9. Amount of maintenance required in normal operation	8
10. Ease of service (materials handling, stock feed, positioning, power, etc.)	10
11. Amount of service required in normal operation	5
12. Precision	3
13. Reliability (freedom from mechanical error or breakdown)	8
14. Automatic control (built-in or ability to add later as retrofit)	1
15. Mechanical safety (freedom from hazard due to process or to equipment failure)	2
16. Operating safety (free from hazard due to carelessness of personnel)	7
17. Other (specify)	
SPEED OF INSTALLATION	10
PLANT CLEANLINESS	5
18. Unit manufacturing cost (labor, materials, supplies, utilities)	
A) . . . at anticipated utilization	8
B) . . . at full capacity	5
GROSS ADJUSTED MODERNIZATION QUOTIENT	
A) . . . at anticipated utilization	
B) . . . at full capacity	

HOW TO USE FACTORY'S AUDIT FORM

1. Enter function or service needed to turn out required quality and quantity of product at line A. List parts or materials at line B.

2. Determine *relative* importance to you of each of the performance factors (lines 1 to 18) as they relate to the function or service being audited. Use any arbitrary scale (here, 0 to 10). Enter in "relative weight" column.

OBSOLESCENCE AUDIT SOLVES A PROBLEM

PART I: Methods or Process Audit

Alternative Methods:

M-1: RIVET WITH HAND-FED RIVETER (1938 model)
(present method and equipment)

M-2: RIVET WITH AUTOMATIC-FEED HIGH-SPEED RIVETING MACHINE
(present method, probable "best" equipment)

M-3: WELDING (SEMI-AUTOMATIC TACK WELDER)
(alternate method, probable "best" equipment)

M-4: ADHESIVE BONDING (BRUSH APPLICATION, SEMI-AUTOMATIC CLAMPING)
(alternate method, probable "best" equipment)

M-1		M-2		M-3		M-4	
MQ	AMQ	MQ	AMQ	MQ	AMQ	MQ	AMQ
100	400	40	160	30	120	90	360
100	200	65	130	55	110	75	150
100	1,000	300	3,000	240	2,400	125	1,250
100	100	50	50	200	200	200	200
100	500	25	125	40	200	100	500
100	700	90	630	60	240	100	700
100	800	120	960	75	600	100	800
100	800	90	720	60	480	120	960
100	800	90	720	75	600	120	960
100	1,000	50	500	75	750	60	600
100	500	75	375	60	300	150	750
100	300	150	450	150	450	150	450
100	800	150	1,200	75	600	100	800
100	100	300	300	200	200	50	50
100	200	200	400	75	150	75	150
100	700	150	1,050	50	350	75	525
100	1,000	90	900	50	500	100	1,000
100	500	100	500	100	500	25	125
100	800	200	1,600	175	1,400	100	800
100	500	250	1,250	175	875	125	625
	11,200		13,770		10,150		11,130
	10,900		13,420		9,625		10,955

PART II: Equipment Audit for "Best" Method

C: RIVETING (M-2)
(Method with highest GAMQ from Part I)

Alternate Equipment

E-1: RIVET WITH HAND FED RIVETER (1938 model)
(Present method and equipment—even if method is excluded, incorporate here as "base" for comparisons)

E-2: HAND FED RIVETER (1958 model)

E-3: AUTOMATIC-FEED HIGH-SPEED RIVETER, TYPE A

E-4: AUTOMATIC-FEED HIGH-SPEED RIVETER, TYPE B

E-1		E-2		E-3		E-4	
MQ	AMQ	MQ	AMQ	MQ	AMQ	MQ	AMQ
100	400	70	280	41	164	52	208
100	200	112	224	68	136	61	122
100	1,000	160	1,600	320	3,200	305	3,050
100	100	120	120	55	55	50	50
100	500	150	750	25	125	35	175
100	700	150	1,050	90	630	85	595
100	800	110	880	120	960	125	1,000
100	800	93	744	95	760	85	680
100	800	110	880	90	720	100	800
100	1,000	105	1,050	55	550	60	600
100	500	90	450	75	375	60	300
100	300	120	360	175	525	150	450
100	800	200	1,600	150	1,200	160	1,280
100	100	100	100	300	300	300	300
100	200	100	200	200	400	175	350
100	700	125	875	150	1,125	125	875
100	1,000	100	1,000	90	900	80	800
100	500	100	500	100	500	100	500
100	800	120	960	197	1,576	223	1,784
100	500	130	650	262	1,310	240	1,200
	11,200		13,623		14,201		13,929
	10,900		13,313		13,935		13,345

3. Enter present method at line M-1; all possible alternative methods or processes at M-2, M-3, etc.

4. Determine Modernization Quotient (or relative capability compared to base of 100 for present method and equipment) for each performance factor for each method. Enter in MQ columns.

5. Multiply MQ by relative value weight for each performance factor. Enter as Adjusted Modernization Quotient in AMQ columns.

6. Add the AMQ figures in each column to get a Gross Adjusted Modernization Quotient (GAMQ) for each method.

7. Select method with largest GAMQ; enter at line C.

8. Repeat Steps 3 through 6 to evaluate equipment for performing the function by the method or process selected at Step 7. E-1 is always present method and equipment (same as M-1) to provide constant "base" for comparison, even if different method was selected at Step 7.

FACTORY'S CHECKLIST TO HELP YOU BROADEN YOUR

FUNCTION OR SERVICE	TYPICAL EXAMPLES
Removing material	Turning, milling, grinding, etching, chipping, eroding.
Forming and shaping material	Rolling, bending, drawing, forging.
Cutting material	Blanking, piercing, shearing, sawing, flame cutting.
Adding material	Plating, dipping, anodizing, dyeing.
Assembling	Fastening, inserting, fitting.
Joining	Bonding, welding.
Mixing	Blending, beating.
Separating	Distilling, decanting, centrifuging, fractionating.
Fine finishing	Grinding, polishing, abrading.
Removing foreign material	Washing, scrubbing, tumbling, air blasting, pickling.
Applying coatings	Brushing, spraying, dipping.
Applying heat	Drying, baking, sintering, annealing, curing.
Removing (absorbing or dissipating) heat from material or product	Quenching, refrigerating, freezing, heat exchanging.
Removing heat from process or atmosphere	Venting, blowing, air conditioning, heat exchanging.
Changing state (liquid-solid, vapor-liquid, etc.)	Melting, casting, precipitating, compressing.
Inspecting for units of dimension	Counting, weighing, measuring, metering.
Inspecting for appearance	Viewing, color-matching, photo-electric scanning.
Inspecting for structure, function, or operation	X-raying, run-in testing, assaying, chemical analyzing, measuring physical properties.
Positioning of parts, materials, or workpieces	Jigging, hopper-feeding, levelating, chucking.
Removing parts or materials from operation	Air-ejecting, gravity dumping, transferring, conveying.
Storing (in-process)	Conveying, racking, palletizing, containerizing.
Warehousing or storing inventory	Stacking, racking, tiering, binning.
Moving or transporting gases	Blowing, pumping, vacuuming; hauling* bottles or tanks.
Moving or transporting fluids	Pumping, gravity-flowing; hauling* bottles, drums, tanks, bags.
Moving or transporting bulk solids	Blowing, vibrating, conveying, hauling*.

OBSOLESCENCE AUDIT . . . *Begins on page 84*

a choice among manufacturers and even among types of equipment. So if the choice is especially broad, you may want to make two successive equipment audits: The first to choose type of equipment, the second to compare makes and models within the "best" type.

Step 1. Define functions, services

Functions and services required will, of course, vary from plant to plant. The checklists at the top of these two pages are not exhaustive, but they cover most of the functions and services that are likely to be encountered in most typical manufacturing plants. Obviously, a tannery, a petroleum refinery, or a steel mill will require some functions and services peculiar to those types of manufacturing. But most of the items on the lists will be found in most plants—if broadly enough interpreted.

Right there is one of the key problems in making an obsolescence audit: How broad or how narrow should be your definitions of functions or services? If definitions are too narrow, you're practically restricting yourself from the outset to nothing more than replacement in kind of specific items of equipment, and the methods audit becomes difficult, if not impossible. But if definitions are too broad, you'll open the gates to so many possible alternatives that you'll be up to your ears in complications (and possibly with a problem in systems analysis on your hands).

The functions and services in the checklist are designed to be at a level of generality suitable for the methods audit. For the equipment audit, you may find it desirable to tighten up on the definitions. This, however, is merely a matter of convenience. The important thing is that the definitions for the methods audit not be too restrictive.

Case in point—Let's take a look at a milling machine. In its broadest terms, the function of a milling machine is to remove metal. Well, other types of machine tools also remove metal. Could a lathe, drill, planer, borer, or grinder perform the particular metal-removing job for which you are currently using the miller? Those are other possibilities for doing the job mechanically.

Today, removing metal—as a function—can also be done electrically. Several firms have electro-erosion or electrical discharge machining (E.D.M.) equipment. Could your particular job be done this way? Or is the newly announced electrochemical milling process (E.C.M.) suited to your job?

The ultimate step, of course, might be to turn to a process like investment casting: Avoid putting metal in the first place where it will have to be removed later. The evaluation of such a suggestion—because of its possible impact on both preceding and following steps in the production process—may be beyond the scope of a simple obsolescence audit and get into the class of systems analysis.

One of the problems in writing definitions is that of classifying certain activities. For example, putting two pieces together might be considered either joining or assembly. Logic seems to indicate that it's joining when you intend the two pieces to stay together permanently; assembling when you intend that they be taken apart at a later time. Yet some adhesives (and we usually think of them in connection with joining) can be made to surrender their bond quite easily. On the other hand, riveting (which we usually think of as assembly) has a high degree of permanence. Actually,

SEARCH FOR ANSWERS TO OBSOLESCENCE PROBLEMS

FUNCTION OR SERVICE	TYPICAL EXAMPLES
Moving or transporting discrete units	Conveying, hand-pushing, hauling*, hand-carrying.
Moving or transporting multiple units	Conveying, hauling*.
Packaging into one-unit product containers	Bottling, canning, boxing, wrapping, bagging.
Packaging into container holders	Boxing, bagging, wrapping.
Packaging into master containers	Cartoning, casing, otherwise "assembling."
Packing for shipping	Palletizing, strapping, bracing, crating.
Disposing of process waste	Neutralizing, clarifying, diluting.
Disposing of sanitary waste	Sewering, treating, leaching.
Controlling plant atmosphere	Heating, cooling, humidifying, dehumidifying; removing fumes, odors, or dust.
Controlling noise	Absorbing, eliminating, isolating noise.
Controlling illumination	Providing light sources; arranging contrast; cutting glare.
Communicating (with permanent record)	Writing, typing, duplicating, printing, recording.
Communicating (transient—no record)	Paging, phoning, televiewing, radioing.
Processing data	Analyzing, filing, calculating, computing.
Providing work spaces for personnel**	Seats, platforms, benches.
Providing personal facilities for personnel**	Lockers, toilets, parking, eating, recreation.
Providing equipment and facilities for maintenance and repair**	Shops and equipment, tools, instruments.
Providing plant utilities (air, water, gas, etc.)**	Compressors, pumps, boilers, instruments.
Providing electrical utilities**	Distribution systems, control centers, instruments.
Protecting plant and facilities**	Alarms, sprinklers, guards.

**Making an obsolescence audit of these functions would require substantial modification of the "performance factors" indicated on FACTORY's audit form.

*"Hauling" includes all forms of intermittent point-to-point movement, such as hand trucks, floor trucks, industrial power trucks, power shovels, cranes, yard trucks, over-the-road trucks, and common carriers.

how you classify doesn't make a great deal of difference as long as you don't allow the specific description to become a mental roadblock to considering alternative methods and equipment.

Step 2. Weight performance factors

The key to effective use of the audit form is assigning weights to the various performance factors. The purpose here—as in any statistical weighting of the elements in a total—is to give those elements an influence or weight that corresponds to their importance in your particular situation, and as they relate to the function being performed.

For example, the box being made by the Jones Company is unlikely to change in the foreseeable future. So you're not too worried about flexibility of the method or equipment. But because it's a highly competitive mass-production item, manufacturing cost and production rate are critical. This product doesn't require much in the way of precision, but because a breakdown could tie up a whole department, reliability is important.

All of these aspects of the problem can be placed in proper perspective by assigning weights to the various factors. Any weighting scale is arbitrary, so you can use any that you want. One to 10 (as in the example, p. 85) is easy to remember and use. If your judgment is keen enough, you can use 1 to 100. Another approach is to assign an arbitrary value of 10 or 100 to unit manufacturing cost, and assign other weights relative to that.

On any scale, the lowest value means the factor is of "virtually no present or future value" as it relates to the function or service being evaluated. The top of the scale represents factors of paramount importance. The use of a zero always indicates that the factor is not applicable in the particular case. (When the MQ is multiplied by zero, it will disappear.)

Weights fixed—Once the weights are established for any function or service, they are not changed. The same weights are used for the same performance factors in evaluating any method or equipment for that particular function. However, it is quite possible that a given factor will have different weights as it is applied to different functions. For example, precision might have a weight of 20 when it comes to applying heat and a weight of 100 when it comes to fine finishing. Or precision in forming or shaping one part might be relatively unimportant, and quite critical with respect to another.

Step 3. Select alternatives

Here's where your technological intelligence system (pages 82-83) comes into play. And it doesn't hurt to add a large measure of imagination and ingenuity.

On the methods audits, the objective is to find as many completely different methods of performing the function or service as seem to offer any reasonable promise of working well.

As a starter, if you're now performing the function mechanically, look for a way to do it electrically or chemically. If this is not fruitful, then look for alternative mechanical methods.

Your equipment audit will call for a bit less imagination and a lot more detail about specific pieces of equipment from your technological information system. If you don't have the information on hand, or if the purchasing agent doesn't have it in his files, then you'll have to start digging for it.

Turn the page

Step 4. Find the MQ

What you're after here is to assign a Modernization Quotient (MQ) to each of the performance factors for the particular method (or piece of equipment) as it relates to the specified function or service. We use the term "quotient" because you're always working against a base of 100, as you'll see below.

The starting point is the arbitrary value of 100 assigned to the present method-and-equipment for every performance factor. Note that this has nothing whatever to do with the weighting (that comes in later). And it makes no difference whether you consider the performance of your present method and equipment to be good, bad, or indifferent. It's still 100, and all alternatives are measured against this as a standard or benchmark.

Get set for hard work—Here's when it begins. Because you now have to start assigning MQ's. As a matter of definition, MQ is an expression of the relative capability of the new method (or equipment) compared to your present method-and-equipment, in terms of the particular factor.

Thus, if a new method can produce four times as many parts per hour as the present one, its MQ for production rate is 400. That's clear-cut. And where possible, you use a simple mathematical ratio.

But consider a factor like ease of operation. Maybe a new method will require less-skilled operators. Here it's a matter of judgment whether the appropriate MQ is 300 or 200 or 110, or whatever. Of course, if the new method requires more highly skilled operators, you could indicate this drawback by assigning an MQ of less than 100. Note that unit manufacturing cost reflects this situation to a degree, but only to a degree. Maybe the higher skill is not readily available in your area—you might have to go into an extensive and expensive program of recruiting, training, and upgrading. Such aspects of the problem are not reflected in manufacturing cost; they *can* be reflected in the MQ for ease of operation.

An important point in determining the MQ is this: An "improvement" in any performance factor is always indicated by a number larger than 100. Thus to indicate a 25% reduction in unit cost, you'd use the reciprocal, or an MQ of 133.

Judgment needed—On some factors, you'll have to rely on your common sense to keep you on the track. Maybe your present equipment has no automatic control and is incapable of having it added. As a straight mathematical ratio, that would mean new equipment with automatic control would have an MQ of infinity. Since this would lead to absurd results, it's obvious that some sort of arbitrary maximum is required.

In many situations, it takes not only keen judgment but some soul-searching to assign numbers to factors that logically cannot be quantified. For example, what value do you assign to reliability that will give you 99.9% assurance against breakdowns for, say, three years? The ultimate difficulty, of course, occurs when you try to evaluate the replacement of a hazardous process with one that involves no danger to personnel. How do you put a number on the safety of a human life?

Accuracy is tricky—You don't need to get involved in splitting gnats' eyebrows on the methods audit. Especially where the weight for a factor is low (say, in the lowest quarter of your scale), an MQ that's within 10% and sometimes even 25% will be adequate. On the other hand, where you have a high weight factor (top quarter of the scale), you'll probably want an accuracy of 5% or less.

On the equipment audit, much greater accuracy is required. First, because you're now making a final selection. Second, because it can serve as a check on the accuracy of the methods audit. (If there's too great a difference between the "best" equipment and the method audit result, you should probably re-do the methods audit with greater accuracy to be sure your guesstimates didn't lead you astray.)

In general, on the equipment audit you should probably be shooting for 5% on the low-weight factors and 1% on the high-weight factors.

A question that's bound to come up is this: How do you get an accuracy of 1% or 5% or even 25% on intangible factors like flexibility, ease of maintenance, or (especially) safety? You can't guarantee it. All you can do is devote the same careful judgment to the intangibles as to the tangibles.

Step 5. Compute adjusted quotient

The weight assigned to a factor is always multiplied by the value of that factor. This is standard statistical procedure for weighting elements in a total. In this case, we call the product of the weight and the MQ the Adjusted Modernization Quotient (or AMQ) for the alternative as it relates to the particular performance factor.

Step 6. Compute gross AMQ

The arithmetic total of the AMQ's for all factors will give a Gross Adjusted Modernization Quotient. This GAMQ will indicate the relative modernization potential of the methods being audited or the equipment being audited.

There's one mechanical trick here: Notice that the unit manufacturing cost calls for an evaluation (both weight and MQ) "at anticipated utilization" and also "at full capacity." Obviously you don't add both figures for the same factor into the total. Instead, you add up two separate GAMQ's.

The GAMQ at anticipated utilization will give you a good picture of relative values for the next year or so. But *if* your company's long-range forecast is for growth and expansion, the second—full-capacity GAMQ—will give you a more accurate, longer-term picture. The ideal solution, of course, is to find a single solution with the highest GAMQ's for both anticipated and capacity utilization.

Step 7. Select the best method

After examining the GAMQ's from the methods audit, you can arrive at a tentative solution as to the "most probable" method for performing the function or service. Now you have to get down to brass tacks and start evaluating specific pieces of equipment for this "most probable" method. (If two methods were very close on their GAMQ, you may well want to make equipment audits for both.)

How an audit pays off

The highest total Gross Adjusted Modernization Quotient will indicate the most favorable method and equipment for modernization—or tell you if your present method and equipment are superior to any available alternative.

Does this mean that the minute you find an alternative with a GAMQ higher than your present method and equipment, you go out and buy it at once? No, sir!

While the audit gives consideration to many of the economic factors involved in modernization, it does not take into account availability of the money for new equipment, the cost of the money for the purchase, depreciation and other tax factors, or salvage value of present equipment. Thus the audit does not take the place of an economic analysis (page 90).

So why make an audit at all? Primarily to select those modernization proposals that hold the greatest potential from an operating point of view. The economic analysis that follows this article will select from among these the ones that have the greatest potential for direct financial return.

Another use for the audit might be to select from among several alternatives, all of which meet some standard financial test (such as two years or less to pay out the original investment).

A third use for the audit is to check your methods improvement or work simplification proposals against your present method and equipment. (This can be a simple one-against-one audit, without considering additional alternatives.)

In these latter two cases, you might well ask, isn't it enough to know that the proposed change will "show a profit"? No, because every plant is literally full of potential improvements that will show a profit. From an operating point of view, your best bet—and it's a trick that will keep your financial people happy—is to select and promote aggressively those profitable improvements that have a high GAMQ. In some cases, it might even be smart to bury some proposals that will show a profit but have an unfavorable GAMQ. A bit of searching will disclose enough profitable ideas with favorable GAMQ's to use all the money that can be made available—and probably more.

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For your obsolescence study the ultimate is . . .

SYSTEMS ANALYSIS

There's always "one best way" to do anything. And the "one best way" to make an obsolescence audit is to analyze all your production facilities and services as a system.

What's meant by "as a system"? Any plant is a system for converting raw material or parts into a salable product. Except insofar as tradition or advertising may have created a preference, the buyer doesn't care what materials or parts are used in the product as long as the product performs its intended function satisfactorily. (Note that the function of a product may be to smell good—as perfume; to taste good—as food; to sound good—as hi-fi recordings; and so on, as well as to turn a wheel, heat a room, etc.) The key element in systems analysis is the function of the end product as it performs in the hands of the consumer.

Thus we can say that the system performs a conversion function. And the "one best way" to make an obsolescence audit starts with the function of the product. From there you work backwards through the system. Not considering each part independently, but as a part of the whole conversion system.

For example, if a product can be made of plastic instead of iron, a grinder, a drill, a lathe (or perhaps all three) may be rendered obsolete not by a better grinder or drill, but by an injection molding machine. Obviously, such a change calls for assessment of consumer reaction, compatibility of the plastic with other parts of the product, capability of the workforce to operate and maintain the new equipment, the extent to which other equipment in the operation would also have to be replaced.

Questions such as these cannot be answered easily, nor by any single person. This type of audit calls for extensive, coordinated effort. At a minimum, it will need a team comprising men from marketing, product design, personnel, industrial engineering, purchasing, and finance. At the other extreme, this can be considered a problem in systems evaluation that would require, in addition, an entire operations research group.

If you want to give serious consideration to this systems approach to the obsolescence audit, here are some important factors to keep in mind:

- Top-flight personnel – highly imaginative and with outstanding technical proficiency – are needed.
- This is not a short-cut. Only in rare cases will you avoid having to check out individual items of equipment in a conventional audit (see text). The system analysis—unless it develops a "breakthrough"—merely assures that the individual elements become part of an optimum over-all pattern.
- Systems analysis is expensive.
- It offers the possibility of a pay-off many times larger than is possible with any conventional analysis.

HERE ARE THE FIVE MAJOR METHODS OF

	BASIC METHOD	OTHER NAMES OR VARIATIONS	FACTORS* INFLUENCING: EARNINGS OR SAVINGS — OPERATING EXPENSE: ANNUAL OPERATING EXPENSE	OPERATING EXPENSE: DOLLARS ADJUSTED FOR TIME-SHAPE OF EXPENSE; e.g., low in early years, high in later	OPERATING RECEIPTS: ANNUAL OPERATING RECEIPTS	OPERATING RECEIPTS: DOLLARS ADJUSTED FOR TIME-SHAPE OF INCOME; e.g., high in early years, low in later	EQUIPMENT OR FACILITY LIFE: SERVICE LIFE OF PROPOSED FACILITY	SALVAGE VALUE OF PROPOSED FACILITY	SALVAGE VALUE OF OLD FACILITY	DEPRECIATION METHOD CHOSEN—Straight-line, sum-of-digits, or declining balance
...THESE TWO ARE ROUGH AND READY, OFTEN MISLEADING										
1	ACCOUNTING METHOD	Average Book, Return on Original Investment, Return on Average Investment, First Year's Profit	√		√		√	√	√	
2	PAYBACK METHOD	Pay-Out, Pay-Off, Cash Recovery Period	√		√				√	
...THESE THREE ARE COMPLEX, BUT SURER YARDSTICKS										
3	ANNUAL COST METHOD	Compound Interest Method	√		√		√	√	√	Annuity and Straight-Line
4	IMPROVED MAPI SYSTEM	MAPI Formula (Machinery and Allied Products Institute)	√	Choice of 3 Time-Shape Patterns	√	Choice of 3 Time-Shape Patterns	√	√	√	√
5	INVESTOR'S METHOD	Discounted Cash Flow, Interest Rate of Return, Profitability Index. Also Present Worth Method and Capitalized Annual Cost	√	√	√	√	√	√	When net investment is used	√

*Checkmark in chart indicates that analysis method normally includes the factor checked. Under Accounting Method chart checked according to Alternate B-2 (page 92) is most commonly used variation of Accounting Method. Payback is similarly checked according to Variation 2 (page 92).

'59 PLAN MANAGED MODERNIZATION

In every modernization decision you stake your reputation and your company's future. Your key to successful decisions is best return.

Rate of Return—

THE TRUE MEASURE of how good a manager you are depends upon (1) how wisely you choose the machines, equipment, and facilities for your plant and (2) how well you manage these assets. To translate these measures of managerial performance into numbers, the rate-of-return methods in the check chart above are used. To rate your modernization proposals as an investment analyst might, you'll need to know the implications of each factor and of each method of calculation —and how to select the one most suitable to your project. (Examples of calculations on pages 92-98.)

How many companies are now using any but the most primitive methods of rate of return on assets as a measure of their modernization proposals—and their managers? Too few. In FACTORY's canvass of 54 companies, only one out of four used a variation of

By LLOYD G. SMILEY, Professional Engineer
Poughkeepsie, N. Y.

CALCULATING RATE OF RETURN ON INVESTMENT

CALCULATIONS											
	INVESTMENT COST			COST OF MONEY							
	INSTALLED COST	DOLLARS ADJUSTED TO TIME-SHAPE OF INVESTMENTS; i.e., when capital outlay takes place	EXPENSING (vs. capitalization) POLICY ON INVESTMENT	INTEREST RATE ON BORROWED CAPITAL	EXPECTED RATE OF RETURN ON EQUITY CAPITAL	INCOME TAX	PROPERTY TAX	PRICE INCREASES OR DECREASES (Inflation or deflation)	KEY ADVANTAGES	KEY DRAWBACKS
	√		√			√			Easy to calculate. Easy to compare with company accounting figures.	Provides bobtail analysis only. Reliable only when annual receipts are uniform and project lasts its useful life.
	√		√			√			Good first cast. Yields indication of risk. Quickly drops out projects with long payback period.	Not really a rate of return.
	√	√	√	√	√	√	√		Good for stable investments with uniform savings such as service equipment (boilers, etc.). Easy to understand; can be used for budgeting.	Poor for projects with fluctuations in annual costs. Has limitations in ranking unlike proposals.
	√		√	√ Fixed	√ Fixed	√	√		Good for cost reduction, modernization and replacement projects. Yields readily understandable rate-of-return figures. Computations simplified by charts.	Depends upon comparison with existing facility. Assumes experience will repeat itself.
	√	√	√	Not required	Not required	√	√		Evaluates expenses and incomes as they occur. Good for large, medium, and small projects. Good for ranking purposes.	Difficulty in forecasting future expenses and incomes. Terms and data inconsistent with common accounting practices.

Toughest Measure of a Manager

any of the three more complex measures above. Practically none were consciously using rate of return as a measure of managerial performance. But the evidence points to this conclusion: In the years ahead the managers who will be rated as best performers will be those (1) who have the personal attributes to get things done through others and (2) *who are able to marshal the most productive assets and maximize the return on these assets.*

FIVE METHODS FOR FIGURING RETURN

The two simpler methods of calculating rate of return are grouped above as:

1. Accounting Method—In its simplest form, a ratio of first year's savings with original investment. Can be modified (Average Book Method) by averaging effect of factors, as shown in Alternate B (p. 93).

2. Payback—In its simplest form, the reciprocal of the Accounting Method. It, too, can be modified and improved by incorporating other factors. Payback is a number (years) and does not express rate of return. But it has value as an indication of risk.

There are three basic methods for the more complex variety of replacement analyses. Each finds its genesis in the work of Prof. Eugene L. Grant of Stanford University. They are based on the application of compound interest tables to obtain annual costs and present worth amounts from the operational data:

3. Annual Cost and Receipts—Uses compound interest tables and a minimum attractive return equal to cost of money. Designed for comparing the operating

MANAGER'S MODERNIZATION *Begins on page 90*

cost advantages of one project with another, but can be extended to produce an index of relative attractiveness of investment by comparing net operating cost advantage after taxes with net investment. Or rate of return can be found by equating alternate plans and solving for the unknown interest rate.

4. Improved MAPI System—Much easier to understand and more comprehensive than the old MAPI method. It allows for different earning patterns, taxes, and different depreciation methods. It, too, is based on compound interest formulas but incorporates chart solutions. It also determines rate of return (MAPI calls it "Urgency Rating").

5. Investor's Method—Based on the "present worth" method developed as a parallel and supplement to the Annual Cost Method. Investor's Method finds a rate of return that discounts net receipts to a present worth amount equal to capitalized amount of investment. It uses special discount (continuous rather than periodic compounding) tables.

MAIN TARGET: COST REDUCTION

Although it is the prime responsibility of the general manager to increase rate of return, he can do no better than the sum of accomplishments in each department. When you come down to it, cost reduction is a form of increasing rate of return.

Improvement in the rate of return on assets can be accomplished in two ways:

. . . *By increasing sales in relation to your total investment*. The sales department must continually improve the market, and the production group must strive to

Five Ways to Figure Rate of Return

Beware of semantics. Few terms have been used as loosely as "rate of return." Ask most plant operating managers how they figure equipment payoff and they'll tell you: "We use rate of return. And we expect the project to pay for itself in X years." What do they mean? Chances are they refer to a primitive variation of the Accounting or Payback Method. These simple ratios when modified in enough ways have their value. But they can't compare with detailed operations and financial analyses, which yield a much more comprehensive rate of return.

SELECTING YOUR METHOD

Each of the five methods for calculating rate of return has its value—and its drawbacks. Your choice of the one you use should be based on the extent to which the method incorporates these factors:

. . . *Suitability*. Is it the best method for the problem?

. . . *Clarity*. Is it easy to understand, easy to apply?

. . . *Time cost of investment*. Does it account for the time value of money? An investment is usually irrevocable until a better machine comes along or until some casualty occurs.

. . . *Time value of costs and receipts*. Does it accommodate all receipts and expenditures as they are influenced by service life, depreciation method, salvage values, operating level, and time?

. . . *Income tax considerations*. Does it account for income tax and its influence on profits as well as interest and depreciation and their influence on taxes?

. . . *Cost of money*. Does it take into consideration the debt ratio, interest on borrowed capital, and earnings on equity capital?

. . . *Capitalization policy variations*. Does it allow for a varying practice of capitalization: how much of the project cost is expensed, how much capitalized?

. . . *Flexibility*. Is is applicable to a wide array of projects? Does it have some built-in means of comparing these projects one with another?

METHODS APPRAISED

To help you select the most suitable method(s) for your modernization project, each of the five basic rate-of-return calculations is demonstrated in the illustrations at right and on the following pages.

1. Accounting Methods

The Accounting Methods are simply ratios of earnings to investments. These ratios may be figured with the gross, net, or average investment. Earnings can be figured in any number of ways—either as total current or average over equipment life, after depreciation, after tax and depreciation, or after depreciation, taxes, and interest.

Accounting Methods are based on annual profit and give the same weight to cash receipts in the last year as in the first. They do not take into consideration the time value of money. They ignore distant earnings or consider them as having the same present worth.

The Average Book Method variation is usually a ratio of the average annual net profits to the average book investment in the plant. Both averages are taken over the life span of the project.

Advantages—Accounting Methods are actually rules-of-thumb tests that will predict a realistic rate of return only under certain restricted and fortuitous circumstances.

The Accounting Methods forecast profits that can be compared with current company accounting figures. They are satisfactory for similar proposals or proposals with similar time-shapes of earnings, but are not good for diverse forms of investments.

Disadvantages—The average return on average investment is unreliable when the useful life and tax life of the equipment are different. Unless these are equal there will be variations in the rate of return.

Because of averaging, these methods will not take care of varying policies of capitalization and depreciation. As the amount capitalized is increased, the return

keep the investment to a minimum while satisfying the demand created by sales.

. . . *By improving profit as a per cent of sales.* Profit can be improved by increasing prices or by holding prices while the cost of goods sold is reduced.

This second approach is the basic one in all cost reduction programs. You reduce the cost of goods sold by reducing labor, material, and overhead costs.

Your problem? Strike the optimum. Buy good, serviceable, productive equipment for as little investment as possible. Run it to get the greatest return.

CLASSIFYING YOUR OPPORTUNITIES

Before making an economic study you must classify the investment opportunity as:

. . . *Replacement (or cost reduction).* Existing equipment is worn out or inferior to what's now available.

. . . *Expansion (of volume or product line).* Many replacement investments enable you to do both.

. . . *Working-conditions improvement.* This is hardest to evaluate, although studied estimates of dollar values for benefits permit rate-of-return calculations.

Here's how to determine what profit the proposed investment will add to your company's operation:

- Define and evaluate all alternatives.
- Obtain actual costs from historical records.
- Make accurate estimates on interest, total installed costs, salvage values, taxes, depreciation, man-hours, labor rates, material costs, machine output, quality, and year-to-year savings and expenditures that will occur from the investment.
- Weigh important intangibles. These include legal, general-improvement, safety and research-and-development requirements; defensive-competitive reasons; and investments because of management's good judgment.

Problem: Compute rate of return for replacement

Assumed data common to all methods . . .

1. Installed cost of new machine (100% capitalized at once) = $18,000
2. Net salvage value of existing machine = $900 or $600 next year
3. Net salvage value, new machine, end of useful life (9 years) = $1800
4. Straight-line depreciation
5. Income tax rate = 50%

. . . for Accounting Method

6. Next year's net operating savings = $8400 before taxes. Total savings over life of project = $38,700 before taxes

. . . for Annual Cost Method

7. Annual operating expenses old machine (not including labor costs) = $5342 before taxes
8. Annual operating expenses new machine, (not including labor costs) = $1500 before taxes
9. Annual labor cost savings, new machine over old = $4000 before taxes
10. Predetermined interest rate (cost of money) = 8%

. . . for MAPI Formula

11. Next year's operating advantage = $8400 before taxes
12. MAPI's predetermined interest rate = 8.25%
13. "Absolute" earnings decline of approximately ⅔ in half of service life

. . . for Investor's Method

14. See estimate of yearly profit in example, p. 97

1 — ACCOUNTING METHOD

Alternate A: 3 versions of Common Accounting Method

1. $\frac{\text{Initial annual earnings*}}{\text{Original net investment*}} = (100)\,\frac{8400}{17{,}100} = \mathbf{49.1\%\ RETURN}$

2. $\frac{\text{Initial annual earnings after taxes}}{\text{Original net investment}} = 100\,\frac{(8400 - 4200)}{17{,}100} = \mathbf{24.5\%\ RETURN}$

3. $\frac{\text{Initial annual earnings after depreciation and taxes}}{\text{Original net investment}} =$

$$100\left(\frac{(8400 - 1800 - (8400 - 1800)\ \ (1 - .50)}{17{,}100}\right) = \frac{100 \times 3300}{17{,}100} = \mathbf{19.3\%\ RETURN}$$

*Investment is sometimes taken as gross, and interest may be deducted from earnings along with taxes and depreciation. Numerous ratios result.

Alternate B: 3 versions of Average Book Method

1. $\frac{\text{Average annual net profits}}{\text{Average book investment}} = \frac{100\ (38{,}700 \div 9)}{9900^{**}} = \frac{(100)\ 4300}{9900} = \mathbf{43.4\%\ RETURN}$

2. $\frac{\text{Average annual net profits after taxes}}{\text{Average book investment}} =$

$$\frac{(100)\ (38{,}700 \div 9)\ (1 - .50)}{9900^{**}} = (100)\,\frac{2150}{9900} = \mathbf{21.7\%\ RETURN}$$

3. $\frac{\text{Average annual net profits after depreciation and taxes}}{\text{Average book investment}} =$

$$\frac{100\ [\,(38{,}700 - 16{,}200) \div 9]\ (1 - .50)}{9900^{**}} = \mathbf{12.6\%\ RETURN}$$

**Average investment with 10% salvage.

2 — PAYBACK METHOD

1. $\frac{\text{Original net investment*}}{\text{Initial annual earnings*}} = \frac{17{,}100}{8400} = \mathbf{2.04\ YEARS}$

2. $\frac{\text{Original net investment}}{\text{Initial annual earnings after taxes}} = \frac{17{,}100}{4200} = \mathbf{4.07\ YEARS}$

3. $\frac{\text{Original Net Investment}}{\text{Initial annual earnings after depreciation and taxes}} = \frac{17{,}100}{3300} = \mathbf{5.18\ YEARS}$

*Investment is sometimes taken as gross, and interest may be deducted from earnings along with taxes and depreciation. Numerous ratios result.

MANAGED MODERNIZATION *Begins on page 90*

is reduced. Where faster write-offs are taken as a result of the tax depreciation practice, then the return will show disproportionately higher for the project with the faster write-off.

2. Payback Method

Here the investment divided by annual savings or net receipts indicates the time needed to get money back into working capital. As with the Accounting Methods, investment may be taken at gross, net, or average. Earnings may be taken in total, after depreciation, or after depreciation and income taxes.

This method is not a rate of return, as such. It is just a good measure of risk. The actual return depends upon what is left after the payoff. This is a function of the service life, time-shape of net receipts, salvage value, income tax rate, depreciation method.

Advantages—Management may use this method as a measure of risk but with the full realization that there still must be a return after payback.

Disadvantages—For the same payback period, long-lived assets are more profitable than those with a shorter life. *Total* profitability, therefore, is not measured by the Payback Method. It's hard for management to determine the correct payback period. It's somewhat arbitrary and often sets up an artificial barrier to replacement.

Payback measures immediate profitability of investment but usually avoids analysis of the period of profitability on investment following payout. It assumes—unrealistically—that the initial advantage will last over the life of the equipment.

3. Annual Cost Method

In its simplest form, the Annual Cost Method indicates the alternative with the lowest annual operating charge. To determine an index of relative attractiveness, (ACM Index), the difference in annual costs between alternatives is treated as earnings and divided by net investment to find the "capital recovery factor." This factor includes the cost-of-money rate and the balance as loss extinguishment.

Computing factor values—The Annual Cost Method (ACM) handles three factors that make up its financial portion (see steps in illustration) in this manner:

. . . *Depreciation.* An annuity factor is obtained from annuity tables and is selected according to salvage value, expected years of service life, and income tax rate. This rate is applied against the net investment to obtain the annual depreciation charge.

Annuity depreciation sinking fund consists of a uniform annual charge "deposited" to earn compound interest so that the deposit and interest together will provide sufficient funds at the end of the service life of the equipment for its replacement. This method is merely a device used to obtain the proper amounts for Annual Costs.

The constant depreciation factor is known as a sinking fund factor or annuity depreciation factor. It is determined by the interest rate and the useful life of the equipment and will be found in most compound interest tables.

. . . *Cost of money.* Directly related to interest and earnings on capital. Total cost of money is found by cost-of-money rate times total investment.

. . . *Income tax.* The development of the income tax factor takes several steps. (See example on facing page for formula.)

Advantages—This method lends itself to analysis of additions, postponement or advancement of replacements, and removal *vs.* continuation of facilities.

It develops comparative values for alternate proposals so an intelligent selection can be made. Tables can be developed for variables that will expedite determination of income tax factor. These tables can be set up for a given cost of money, service life, salvage value, tax rate, and debt ratio.

This method is good because management is used to thinking in terms of annual costs and revenue. Data are usually kept in annual cost form. It can be used for budgeting purposes. Calculations are of medium difficulty once you have developed your tables.

Disadvantages—There are some limitations in comparing projects of unlike characteristics for ranking.

Some objections might be raised because a predetermined cost of money is required. The method also assumes an annuity depreciation rate in order to arrive at uniform annual depreciation cost. This depreciation method is fictitious with respect to accounting practice but necessary to obtain this portion of the annual cost. Earnings (or savings) between projects likewise must be considered uniform.

4. Improved MAPI System

The objective of MAPI is to determine how the business would profit with and without the project, and how much savings or operating advantage there would be in the next year with the investment. It applies principally to depreciable assets for replacement, improvement, and expansion projects.

MAPI, when first introduced, was theoretical, academic, and heavily sprinkled with confounding terms. The improved method uses the same basic theory but expands it and brings it down to earth. The improved method considers different earning-rate patterns based on the effects of deterioration and obsolescence of equipment—plus the effect of any one of the three accepted tax depreciation methods. It also yields an after-tax return on investment easily convertible to other accounting and payoff rates.

The MAPI system is set up so that the relative return, a function of the period of deferment, usually increases as the deferment increases. In other words, the longer you postpone a project, the greater will be your return from it. Putting it another way, you forego greater savings as the deferment increases, but you also incur ever-increasing costs. This relative return is obtained by comparing a potential replacement with its best alternative in the plant. The best deferment alternative is the one relative to which a return from a project is the lowest. These relative returns become the ranking factor.

How MAPI works—Five factors enter into the determination of the relative return:

1. *Net investment.*
2. *Next year's operating advantage.*

Turn the page

3. ANNUAL COST METHOD

Step 1 Annuity depreciation

= (Annuity depreciation factor) (Installed cost)

= (Annuity depreciation rate at 0% salvage) (100 − percent salvage) (Installed cost)

= (8.008%*) (90%) $18,000 ..... $1297

Step 2 Cost of Money

= (Cost of money rate) (Installed cost)

= (8.0%) $18,000 1440

Step 3 Income tax

= Income tax factor (Installed cost)

$$= (\text{Adjusted equated cost of money}) \left(\frac{\text{Income tax rate}}{1 - \text{Income tax rate}}\right) \left(\frac{100 - \text{percent interest is of cost of money}}{100}\right) (\text{Installed cost})$$

$$= (4.85\%^{**}) \left(\frac{.50}{1 - .50}\right) \left(\frac{100 - 22.2}{100}\right) (18{,}000)$$

= (4.85%) (1) (.778) (18,000)

= 3.77% (18,000) 679

Step 4 Annual operating expenses new machine 1500

Step 5 Total gross annual costs for new machine $4916

Step 6 Salvage credit

= depreciation for coming year + cost of money + income tax

a. Depreciation on existing equipment for coming year

= (Net salvage of existing machine now) − (Salvage value of existing machine 1 year later)

= 900 − 600 ..... $ 300

b. Cost of money

= (Cost of money rate) (Net salvage of existing machine now)

= (8.0%) (900) 72

c. Income tax

= (Income tax factor) (Net salvage of existing machine now)

= (5.26%) (900) 47

(Income factor developed as before; using 66% salvage realized in 1 year, value pro-rated for 3 years)

Total salvage credit ..... $ 419

Step 7 Labor savings when new machine is installed 4000 4419

Step 8 Net annual costs for new machine ..... $ 497

Step 9 Annual savings in favor of replacement now after income taxes

Annual operating expenses or total costs of existing machine	$5342	
Less net annual costs for new machine	497	
Annual savings in favor of replacement now	$4845	
Net annual savings after income taxes		$2423

Step 10 Index of relative attractiveness of investment

$$= (100) \frac{\text{Annual savings after income taxes}}{\text{Net investment}} = (100) \frac{2423}{17{,}100} = \mathbf{14.2\% \text{ ACM INDEX}}$$

ACM Index is the index of relative attractiveness or ranking factor, for different investment proposals. It measures the benefit of one plan over another for the life of the project. This return will almost always go higher as time goes on. The 14.2% return consists of 8% cost of money and 6.2% loss extinguishment or return beyond the cost of money.

Note: When investments are made at different times or where disbursements are non-uniform, convert all costs to present worth amounts for comparison of alternate plans. Then convert to annuity to get annual costs. Expenses common to alternate plans are omitted. Method incorporating income tax developed by M. K. Smith, Basic Studies Engineer, and two associates, American Telephone and Telegraph Company, Department of Operation and Engineering, 1952.

*i = cost of money rate. See 8% compound interest tables, *Principles of Engineering Economy*, Eugene L. Grant, The Ronald Press Company, 1950.

**From Formula A.

Formula A

Adjusted equated cost of money rate

= (annual annuity depreciation rate) + (annual cost of money rate) − (straight line depreciation rate with monthly accruals)

= (8.008%) (90%) + (8.0%) − (10.36%)*** (***From Formula B)

= 7.2072 + 8.0 − 10.36 = 4.85%

Formula B

Straight-line depreciation rate with monthly accruals

$$= (\text{Annual straight-line depreciation rate}) \ (100 - \text{percent salvage}) \left(\frac{\text{Accrued monthly depreciation rate}}{\text{Annual depreciation rate}}\right)$$

= (11.11%) (90%) (1.036)**** = 10.36%

****From Formula C.

Formula C

When cost of money rate is 8%, $\left(\frac{\text{accrued monthly depreciation rate}}{\text{annual depreciation rate}}\right) = \frac{8.0}{(7.72)^{*****}} = 1.036$

*****See tables, page 187, "Ten-Place Interest and Annuity Tables," Frederick C. Kent and Maude E. Kent, McGraw-Hill Book Company, 1926.

4. IMPROVED MAPI SYSTEM

Step 1 — Required Investment

Installed cost		$18,000
Less investment released or avoided:		
Net disposal value of existing machine	900	
Capital additions required in absence of project	0	
Net investment		$17,100

Step 2 — Total next-year advantage after income tax

Next year operating advantage		$8400
Including net increase in income from improved quality and quantity and net decrease in operating costs from reduction in expenditures for material, labor and overhead		
Plus next-year capital consumption avoided:		
Disposal value decline during year		300
Next year's pro-rated amount of capital addition		0
		$8700
Total next-year advantage after 50% income tax		$4350

Step 3 — MAPI chart allowance

Use MAPI Chart No. 3,* which conforms to 2/3 earning run off in half of service life. Enter Chart 3 at 9 years on horizontal line, proceed upwards to 10% salvage on straight-line depreciation curves, read across to obtain chart percent of 10.

MAPI Chart Allowance = Installed Cost × Chart Per Cent = $18,000 × 10% = $1800

Step 4 — Amount available for return on investment

Total next-year advantage after income tax	$4350
Less MAPI chart allowance	1800
Amount available for return on investment	$2550 = annual after-tax savings in favor of replacement now.

Step 5 — $\frac{\text{Amount available for return on investment}}{\text{Net investment}} = 100\left(\frac{2550}{17{,}100}\right) = 14.9\%$ MAPI URGENCY RATING

The Urgency Rating is the minimum relative return — the ranking factor. It measures the benefit of having the project as against deferring it for one year. The relative return almost always goes higher the longer you defer replacement. The 14.9% return consists of 8.25% cost of money and 6⅔% as loss extinguishment or return beyond the cost of money.

*See charts in *Business Investment Policy*, by George Terbough, Machinery and Allied Products Institute, 1958.

Note: An assumption that "absolute" earnings (projected earnings after depreciation, taxes, and cost of money are considered) decline ½ in half of the service life produces an 18.1% Urgency Rating. A decline of ⅓ in half of the service life produces a 20.2% Urgency Rating.

MANAGED MODERNIZATION *Begins on page 90*

3. *Next year's capital consumption avoided.* Capital consumption is avoided by retiring the equipment now and obtaining an increased disposal value rather than waiting until next year.

4. *Next year's capital consumption incurred.* This is the value that the proposed project investment will lose during the ensuing year. It's the hardest to estimate —but most important to the MAPI system. And this is where the formula and charts for capital consumption and resulting earning patterns come into play.

5. *Next year's income tax adjustment.*

From the above five factors the next-year after-tax return from a project can be determined.

Variable and fixed factors—The MAPI charts incorporate five variable and three fixed factors:

. . . *Variable.* (1) Three earning-rate projection patterns show decline in earning power because of accumulated depreciation and obsolescence. These include straight-line declining, and slow and fast initial declining rates, ½, ⅓, and ⅔, respectively, in half the life of the asset. (2) Estimated service lives vary between 5 and 40 years. (3) Estimated terminal salvage as a per cent of first cost varies between 0 and 50%. (4) Any income tax rate can be applied. (5) The three approved methods of tax depreciation are accommodated.

. . . *Fixed.* (1) The debt ratio is frozen at 25%. (2) The interest rate on borrowed and non-interest bearing capital is figured at 3%. (3) The after-tax return on equity capital is fixed at 10%.

It can be shown that reasonable differences in these three items have little effect on the results, and minor deviations can be ignored.

Advantages—The improved MAPI system is easy to comprehend and apply. It's especially good in cost-reduction and modernization proposals. All compound interest calculations, tax depreciation, earnings, patterns, and the like, have been simplified by charts and tables. Forecasting years ahead has been made comparatively easy.

The familiar one-year test is used because it's consistent with prevailing practice, existing methods, and thinking. Its data are simple to compile. The system ties in well with capital budgeting.

Disadvantages—As with the Annual Cost Method, exception might be taken to the predetermined cost of

5. INVESTOR'S METHOD

Year	Profit Before Depreciation	Depreciation Deduction	Cash Flow-Back After 50% Income Tax On Income	Cash Flow-Back After 50% Income Tax On Depreciation		Total Cash Flow-Back After 50% Income Tax (Total Receipts at 0% Interest)	Discounted Cash Flow-Back* At 14%		At 15%	
1	$8400	$1800	$4200	+$900	=	$ 5100	×.9332 =	$4759	×.9286 =	$4736
2	7800	1800	3900	900		4800	.8112	3894	.7993	3837
3	6900	1800	3450	900		4350	.7053	3068	.6879	2992
4	5600	1800	2800	900		3700	.6131	2269	.5921	2191
5	3800	1800	1900	900		2800	.5330	1492	.5096	1427
6	2600	1800	1300	900		2200	.4634	1020	.4386	965
7	1700	1800	850	900		1750	.4029	705	.3775	661
8	1100	1800	550	900		1450	.3502	508	.3250	471
9	800	1800	400	900		1300	.3045	396	.2797	364
10	1800**		1350**	–0–		1350**	.2647	357	.2407	325
						$28,800		$18,468		$17,969

To determine rate of return, interpolate between present worth interest rates to find discount rate that causes cash flow-back to just equal $18,000 investment.

$$\frac{18{,}468 - 18{,}000}{18{,}468 - 17{,}969} = \frac{468}{499} = 0.009 = 0.9\%$$

Add 0.9% + 14.0% = **14.9% RATE OF RETURN**

To determine calendar payback period, trace cash flow-back after taxes to point where cumulative total equals $18,000 investment, as follows: $5100 (first year) + $4800 (second year) + $4350 (third year) + $3700 (fourth year) + $\frac{50}{\$2800}$ (fifth year) = $18,000. Time lapse = 4.02 years. **CALENDAR PAYBACK = 4.02 YEARS**

*Present worth factors based on continuous compounding uniformly throughout the year just as cash flow-back is likely to occur. See: "Interest Tables for Determining Rate of Return on Profit Projects," J. C. Gregory, The Atlantic Refining Company, 1954. Less accurate but satisfactory results can be obtained by using present worth tables as developed in "Principles of Engineering Economy," Eugene L. Grant, The Ronald Press Company, 1950.

**$1800 Salvage credited to operation at end of useful service life. 25% capital gains tax deducted. No credit to new machine project for salvage of old machine. Any credit from sale goes to old machine credits to improve its rate of return. No double salvage.

money rate used by MAPI. But reasonable variations have little effect on the end result. And calculations are restricted to the three earnings projection patterns.

5. Investor's Method

The Investor's Method is also known as Discounted-Cash-Flow, Interest Rate of Return, and Profitability Index (see FACTORY, October 1955, p. 92). Its improvement over the Annual Cost and MAPI methods depends upon the introduction of present-worth factors and continuous compounding of interest.

In essence, the Investor's Method discounts the cash flowback after taxes over the years until it equals the present worth of the investment. This method requires two steps:

Step 1. Set up a timetable by years of all expenditures and receipts predicted to occur over the life of the investment.

Step 2. By trial, extend these entries by the continuous compound interest rates until your present-worth values of receipts equal your investment. Present-worth discount rate that yields this equality is the rate of return.

Using the Investor's Method, it makes no difference when you invest, either before or after the project starts up. The amount of expenditures and receipts can also vary. Capitalization, amortization, and salvage value can also fluctuate. It is the one method that evaluates differences among proposals in the precise time-shapes of future earnings. It takes into consideration the full-life characteristics of each project. It does not rely on averages or predetermined factors of interest.

Advantages—The Investor's Method has the flexibility of absorbing expenditures and revenue as they occur, handling any amount of money expended before the projects start up as well as the money spent and returned afterwards. It yields a rate of return showing immediately what the project will earn at a constant rate of cash profit on the unreturned outlay throughout its life.

This method is uniformly applicable to all types of problems. It's good for ranking purposes. It answers the question: Is this investment worthwhile, and will it contribute real profits?

Disadvantages—The major objection to the Investor's Method is the difficulty in projecting with a high degree of accuracy, many years in advance, the expenditures and receipts that will occur. But the importance of

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these estimates when extended by the present-worth factors diminishes with time.

The rate of return may be misleading, however, since it is inconsistent with company accounting practices and fails to approximate the profits from a project as they will appear on the books throughout the life of the investment. The Investor's Method provides only one rate of profit throughout the life of the project, which is unrealistic. This makes it undesirable for projects that start up slowly.

MEASURES FOR YOU TO TAKE

Up to this point you have been concerned with the mathematics and theory of rate-of-return calculations. But you should also be armed with dollar facts from engineering studies. And the physical feasibility of the alternatives should have been confirmed, all costs associated with the installation considered, and the operating level of the facility established. (See page 156.)

There are four other considerations, often overlooked, that should temper your managerial judgment:

. . . *Replacement timing.* Because of tax loss, availability of funds, priority investments, expansion plans, and other reasons usually known only to top management, timing of replacements becomes important. Reasons for timing or phasing an investment should if possible be made known to all interested parties.

. . . *Overhead costs.* An over-all per cent figure of direct labor should not be used. Instead, the chart of accounts should be analyzed in detail to determine what effect the investment will have on overhead costs. In other words, each productive piece of equipment should carry its fair share of overhead. This can be assured only through detailed apportionment.

. . . *Projection patterns.* Sales receipts, depreciation rates, and expenditures should be predicted as accurately as possible. Trends should be established, and historical records should be referred to. These entries are hard to arrive at, but if justice is to be done, ample treatment must be given them.

. . . *Price level.* In all the analyses one of the biggest single factors that renders them less effective is the effect of price level on receipts and disbursements that are to occur in the ensuing years. It can be inflationary or deflationary—more likely the former. In any event, sales, costs, and profits become difficult to predict. Care should be taken to consider what is happening in the economy as well as what is happening in real dollars. Remember that the forecasts of price increases favor replacement now!

JOB FOR ALL OPERATING PEOPLE

It cannot be over-emphasized that a successful study begins with all responsible parties participating. Contributions of the operating line foremen, supervisors and managers, maintenance supervision, accounting heads, purchasing agents, the production control staff, and engineering departments are all necessary to the study. These people are the roots of a sound and orderly modernization program.

What You Should Know

The influence of depreciation and interest combined with taxes needs special attention. Shrugging off these factors as of little concern to plant management is not the solution, because the decision to postpone an investment often has its basis in them.

WHAT DEPRECIATION IS

Depreciation is simply a prepaid expense to assure investment recovery. It assumes an accurate prediction on life and salvage and makes no allowance for price-level changes.

Profits after taxes and dividends largely determine the amount that can be spent on modernization and expansion. Depreciation reduces income reported to government and stockholders. As a result, it is a systematic way of providing for future equipment, a way of accumulating tax-free funds for replacement.

Two factors determine rate of depreciation:

. . . *Service life.* Affected by physical deterioration, inadequacy, obsolescence (because something better is available), changes in the art, legal requirements, diminished or increased demand, or casualties.

. . . *Net salvage value.* Affected by future service demands, technological developments, the possibility of re-use, resale or junk value.

Methods of depreciation—There are three principal methods of applying depreciation:

. . . *Straight-line.* A uniform distribution of cost, less salvage value, over the useful life of the equipment. It is used most extensively because it is simple, easily applied, and easily understood. Historical data have usually been collected in straight-line depreciation form.

This method results in a higher total cost in later years, when higher maintenance costs are added to the uniform annual cost. As the equipment ages, efficiency goes down and obsolescence increases. No allowance is made for periods of high use, usually occurring in the early years.

Asset becomes half-depreciated in half the life.

. . . *Double declining balance.* Uses a constant percentage factor up to double the straight-line rate and applies it to the undepreciated value of the asset with no allowance for salvage. This permits about two-thirds depreciation in half of the life.

This method of depreciation has a tax advantage in the early years, but you cannot deduct tax-free any amount greater than twice the straight-line depreciation rate. It's possible to change from straight-line to the double declining balance or back again when it is to the company's advantage.

. . . *Sum-of-the-digits.* Considers the depreciation factor as a fraction that varies over the life of the equipment. This fraction for a given year is arrived at through the ratio of the remaining service life in years to the sum of all the years in the useful life of the equipment. This rate is applied to the first cost minus the salvage value and varies for each year. About three-fourths of the depreciation occurs in half of the asset life of the equipment, and it becomes fully depreciated at the end of the useful life.

About Financial Factors in Modernization

Pros and cons—The declining balance and sum-of-the-digits depreciation make a greater return contribution to working capital during the early years. It can be argued that the equipment used under these methods also makes greater contributions to production during the early years.

A faster, earlier write-off is good for growth companies making substantial profits but not yet paying proportionate dividends. If funds made available are reinvested in modernization and productive facilities and not raked off as dividends, the company can continue to defer taxes in proportion to their continued rate of investment. Fast write-off saves taxes, provides funds for self-financing.

Total costs tend to remain constant with fast write-offs since maintenance and repair costs go up as depreciation goes down. On the other hand, straight-line depreciation is probably more desirable where there's an increasing demand for products or anticipation of higher profits later on. You might want the higher depreciation derived from the straight-line method to help offset the higher income.

Effect of price levels—When prices rise, depreciation deductions fall short of funds to replace equipment. In effect, income is overstated and income taxes become inequitably high. To replace equipment then, depreciation reserves must be supplemented by current earnings or savings from taxed income.

COST OF MONEY RATE

Investment in building and equipment involves giving up the opportunity to earn on investments elsewhere. Consequently, it will help in the establishment of an interest rate if it is known what other investments are earning. Whether the money comes from the outside or from within, interest (the cost of money) should be charged. And these interest costs must be allowed for in figuring net receipts.

A composite interest rate should seldom be less than 5 or more than 10%; most likely, somewhere around 7 or 8%. It's better to establish a rate (see below) rather than compensate in other ways.

Interest on borrowed funds—There are three elements in the establishment of interest rate on borrowed funds: (1) pure interest charge, (2) administrative expense of carrying out the loan contract, and (3) insurance against risk of loss.

Pure interest rate is determined somewhat by the size and stability of the company, its assets and integrity, and the range of the current cost of money. Some expense for administering the loan should be added. Risk can be accounted for by establishing the minimum attractive return on new money in relation to the cost of money on existing debt.

Interest on capital—Enough revenue must be brought into the business to pay all costs incurred, including the cost of reinvestment, plus a margin for a satisfactory return. It is essential that this return be sufficient to attract capital into the business without excessive debt in relation to equity capital. Under no circumstances should outside capital procurement jeopardize the integrity of the firm.

An over-all interest rate to be used for internal and external capitalization can be based on what the debt capital earns as well as on what the equity capital earns. Earnings of the company must provide for interest and amortization on debt capital as well as for dividends and fixed assets replacement on equity capital.

Estimating an interest rate—You can make a pretty fair estimate yourself with the aid of your company's annual report. Here's how:

. . . *To find the interest rate on borrowed funds,* search the financial statement for mention of the interest rate for long-term notes. Suppose it's 4%.

. . . *To find the interest rate on internal capital* look at the liability and net worth side of the balance sheet for (a) total equity capital. Now on the profit-and-loss statement for the current year find (b) net earnings after taxes. Ratio of (b)/(a) is the interest rate on internal capital (return on equity). Let's suppose it's 7.5%.

. . . *To find the composite interest rate,* you now need to know what portion of the capital is borrowed and what portion is internal. To do this, look at the liability side of the balance sheet again. Find (c) the total amount of long-term notes (or funded debt). Ratio of $c \div c+a$ is the debt ratio. Supose in this case it's 12%. The composite interest rate is calculated as:

Debt ratio (0.12) $\times$ interest rate on borrowed money (0.04) $+ 0.88 \times$ return on equity (0.075) = cost of money or capitalization rate = 7.1%.

In effect the capitalization rate is the bare minimum that your modernization project will have to earn if it is to break even with current investments.

EFFECT OF TAXES

Now's the time for operating managers to face up to the reality of the income tax burden on business. Federal income taxes are influenced by or affect earnings in three ways:

. . . *Taxes cut earnings almost in half.* That's the way financial people must look at it. In figuring rates of return, it's realistic to apply the appropriate tax rate (52% for most corporations) to earnings.

. . . *Depreciation softens the tax bite on income.* Depreciation costs are charged to operating expense and credited to the depreciation reserve account. Each dollar deducted for depreciation means that about half can be retained instead of going to the government.

. . . *Taxes are lessened by net interest charge.* Interest as it influences taxes on the company's operation must be taken into account. Interest on debt is fully deductible from the net income before taxes.

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'59 PLAN
MANAGED MODERNIZATION

Takes selling savvy to loosen the strings that tie up the cash bags. So if it's selling skill you need to put your proposals across, here are 34 tips on . . .

How You Can Sell

LIKE TRYING to squeeze an orange through a piccolo. That's how hard it often is to push your pet modernization proposal through to approval in your plant.

And small wonder. While aimed at profit improvement, modernization projects strike close to the balance line between profit and loss. Even near misses in capital expenditure can upset delicate profit margins. Wrong guesses are disastrous.

So when today's plant operating executive unsheathes his modernization plans, he steps into a target area that gets close scrutiny from the high echelons of management, including the board of directors. It's his opportunity to be a hero. But it's also a chance to put his head in the noose. That's why you need to prepare yourself better than ever. First to design your modernization plans with care. And then to sell them with skill and determination. You'll find help in 19 tested ways to sell your ideas (text below) and in 15 tips from successful salesmen (panel, p. 102).

TOP MANAGEMENT WANTS TO BUY

That's the paradox of selling modernization proposals up the line.

"We want to spend money on modernization if it's going to save us money" is the way one financial control officer of a 26-plant firm put it to FACTORY editors. "There's only one reason a good idea isn't acted upon here: Knowledge of the value of the proposal doesn't get to the top. People are lazy. They don't put their facts down on paper. I and the director of manufacturing have to keep needling our managers to turn in their valid requests."

Or listen to this flat statement of policy—in a tough year—by President T. L. Strimple of The National Acme Company (Cleveland): "We have spent a disproportionately large amount on modernization this year because this seems the best time to reduce costs."

Works Manager Ralph E. Williams, of De Laval Separator Company (Poughkeepsie), talks of his company's eagerness to buy: "If I can't sell a capital expenditure proposal to a modernization-minded man like my boss (De Laval President W. A. Neumann Jr.), I feel we mustn't really need it."

Another executive in an influential spot has this to say: "Truly, the hardest people to sell are ourselves. If we believe it's in the best interest of the company to buy, then we'll keep hammering away at the board until the necessary money is made available. Rarely have we been turned down on an item about which we ourselves were convinced."

THE DIFFICULTY: FIND YOUR TARGET

If higher management wants to buy modernization, why is it so hard to sell? Any good salesman can give you the answers to that: To sell successfully you must have more than a good product and a willing market. You must (1) know your audience, (2) find the key men who can make or break the sale, and (3) use the best selling techniques.

To sell modernization intelligently, the plant operating executive must get the perspective—not only of operating people—but also of those influential officers who sit in financial, marketing, and control chairs. (You'll find help in getting this perspective on pp. 105-106). But beyond this you must also find—and be sensitive to—the most influential man (men in many instances) in the capital expense picture.

The functional identity of these influential men and their organizational levels vary all over the lot. At Thompson Product's TAPCO Division (Cleveland) it's the staff director of industrial engineering. In a large rubber mill in New England, it's the general manager. Lincoln Electric Company (Cleveland) claims the toughest man to get an appropriation request past is the time-study methods chief. A chief industrial engineer for a greeting-card company spelled out what

By L. R. BITTEL, FACTORY

Modernization Ideas Up the Line

is probably the most common situation: "Top management sets the capital appropriation budget. But it's the plant manager who makes the specific decisions."

At many companies, it's one man—the president. At both Standard Pressed Steel Company (Jenkintown, Pa.) and Parker-Hannifin Corporation (Cleveland) the president must be completely sold. SPS Purchasing Director Moorhouse warns: "Beware of Tom Hallowell (company president) if it isn't really a modernization proposal—just a log rolling deal." C. J. Giblin, division manager for Parker-Hannifin says, "Our president is an engineer with a manufacturing background, and that certainly helps."

Financial and executive officers guard the cash bag—and provide the stiffest hurdle for modernization plans. So say plant operating people interviewed in several plants. At Titeflex, Inc. (Springfield, Mass.), the treasurer is the hurdle. Warner & Swasey spokesmen say the toughest nut to crack is the executive vice president, but they're not unhappy with this: "If we had a financial man we'd have all sorts of forms. As it is, we don't have too many fingers in the pie and so we have a smooth, effective modernization program." At a midwestern electric equipment manufacturing plant, however, the operations vice president looks the treasurer square in the eyes: "Toughest man to get a modernization proposal through? I'm looking at him."

What does all this mean to you? Take time and mind to search out the key men in your organization. Find out how they think, what they look for. Then develop a sales plan to fit the proposal and the men to be sold.

THE ESSENTIAL INGREDIENT: FACTS

A word of caution: Personal persuasion is invaluable in winning support for your modernization projects. But it cannot add to the inherent value in your proposal. And no one knows this better than the men in your plant who are near the money. They want unvarnished facts.

"No amount of drumbeating will alter the committee's vote," says the treasurer of one Ohio company, "unless there is a complete and adequate analysis." At Link-Belt Company (Chicago) Vice President of Manufacturing William Hoefman verifies this emphasis on facts. His executive committee is most impressed by a thorough equipment replacement analysis report. And this seems to have a strong bearing on whether a project will be accepted. "We'd get no place without thorough documentation," says the plant manager of one company. "If I've got my facts at my fingertips," says another plant manager, "I've got no trouble."

Here's how the president of The National Acme Company puts it: "My plant men must get the facts. If the facts aren't convincing—if there wasn't thorough researching of the problem—a proposal won't pass." W. Harvey Thompson, vice president and general manager of H. K. Porter Company's Riverside-Alloy Metal Division, told us: "Proof positive on payback is all we need to sell modernization at Porter."

19 Tested Ways to Sell

Now you're ready to sell your modernization proposal. You've got the best plan. You've assembled and checked your facts. You've picked out the men who are your toughest hurdles. All you need is an armory of tested ideas for winning their support. So let's go.

1. Establish a long-range relationship. Nothing seems to be quite as effective as your record of proven achievements. "Much depends upon the confidence the board has in you," says one plant engineer. In other words, if your judgment has been good in the past, top management is inclined to believe it will be good in the future. "If a man is any good, his opinions will be heard," says Moorhouse of SPS. "Any sound management knows it's the people who make the dollars for it."

"Past performance is the best assurance of a favorable reception," says the production manager of another

You'll get bonus help in selling with these . . .

15 SALES TIPS FROM SALESMEN

1. Go piggyback. Hitch your idea onto the current "hot" program in the plant. For instance, a waste-reduction drive is a good thing to hitch onto.

2. Make it easy to say "Yes." Ask yourself whether you'd say "Yes" if you were in the driver's seat.

3. Offer a trial run. Like a salesman's sample. If you want six machines, see if you can buy one—then show how it pays off.

4. Buy now, pay later. If money isn't available, look into short-term leasing. All the company has to do then is risk one year's expense.

5. Knock down a straw man. If your boss has a pet peeve, show how existing equipment contributes to it, how your proposal will help.

6. Don't put all your eggs in one basket. For instance, if the problem is replacement of a battery of screw machines, try selling replacement of part of the battery with known performers, the remainder of it with new equipment you haven't yet tested.

7. Prepare a rebuttal. Anticipate the soft spots in your proposal. Say, for example, you want a tool that needs an extra firm foundation. If the committee asks whether this foundation won't boost costs, say you've selected a spot where the installation can be made without spending extra money.

8. Try the soft sell. Let the buyer see the advantages for himself, then talk himself into the proposal. If you mention to your boss that a conveyor would speed assembly, let him make the point that it would also cut costs.

9. Capsulize your presentation. Even the busiest executives can spare 10 minutes (but seldom more) to listen to a profit-making idea.

10. Tie it in a package. If the company has a long-range program for developing new products, for instance, show how your proposed layout change fits these plans. Add other bits and pieces as you go.

11. Suggest a committee. If your proposal gets the frigid treatment, suggest a committee review it. If the committee gives it a blessing, it should carry weight when you resubmit it.

12. Play the devil's advocate. You can take the wind out of an objector's sails by making all the critical arguments yourself—then answering them.

13. Horse trade. Suppose you suggest six projects. Another department also submits several attractive projects. There isn't enough money to go around. Your move: Acknowledge the interest of the company as a whole, offer to postpone some of your projects if your top ones get quick approval.

14. Use the union. It has influence in many companies—especially on projects like lighting, washrooms, cafeterias. Properly tipped off, it can push its interest when it talks to top management. (Caution: Use with discretion.)

15. Catch your prospect off guard. If your boss takes half a day to say "No" on a major project, pop a smaller idea on him. A switch from a small to a large request sometimes works, too.

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"... make a point

company. George Willis, division superintendent at Lincoln Electric says: "A man's reputation precedes him. If cost reduction doesn't materialize on a new installation, the climate for that man's proposals in the future becomes chilly."

2. Be conservative in your claims. One controller actually adds his own contingency figure of 10% to the cost of each proposal "to compensate for over-optimism on the part of plant people." Says Gerard Scheyer, plant engineer for Adamas Carbide Corporation (Kenilworth, N. J.): "Management just isn't interested in preposterous predictions."

3. Use visual aids to improve your presentation. At The Louis Allis Company (Milwaukee) the manager of industrial engineering, William Conway, documents each of his proposals with curves showing payoff time and savings. He makes these curves himself on plain graph paper with an occasional point outlined in colored pencil for emphasis.

Amateur movies help sell at Bell & Howell Company, (Chicago). Vice President of Manufacturing R. L. Chyrchel recalls that for one large appropriation, figures alone weren't strong enough to sell the board of directors. The job was to show how complex the problem of moving component parts became when they were shifted back and forth between plants. So Chyrchel had a man on his staff take a 15-minute amateur black-and-white movie recording every step as a $1.50 item (a projector shuttle) moved through 42 separate operations from one plant to another. The movies were shown at the next meeting of the board of directors. The proposal was passed, Chyrchel reports.

At Chas. Pfizer & Company, Inc. (Brooklyn), visual aids of all types are used to clarify modernization proposals, according to B. J. Quinn, production manager.

4. Offer plenty of details. Not only must the facts upon which a proposal is based be sound. They must also be available in depth and detail. "I have to be prepared to give complete details to the finance committee," says the vice president for operations of a machine tool company, "because any delay in answering the questions the committee raises means a delay in getting the new equipment. If, for instance, I can't put my finger on some information right away, it means a month's delay before the committee meets again to hear the whole story."

An executive vice president in another company told FACTORY off the record that he had to return one out of every four requests for additional information. Ross Dreyer, vice president of manufacturing for Griffin Wheel Company (Chicago), points out that one of the most helpful tools in selling his ideas to higher management has been his ability to show that every assumption he made in arriving at his future estimates was based on the best available figures.

At still another company, a spokesman said that the executive committee was especially impressed by a thorough report of equipment replacement analysis—and that such a report seems to have a strong bearing on whether a project is accepted.

# of offering as many options as possible"

5. Provide alternate solutions. "I want to be sure that all possibilities have been considered," says the treasurer of an eastern foundry, "that the requester hasn't gone off half-cocked with a fixation that there's only one machine or one solution."

This attitude is held also by H. J. Kendall, secretary and assistant treasurer for Paterson Parchment Paper Company (Bristol, Pa.). Kendall tells this story of the executive committee's search for a better way: It rejected a proposal for replacement in kind of existing 8-in. belts. Instead the committee initiated purchase of 2-in. nylon belts at a greater initial cost but longer life. In another instance, the committee turned down a project for repair with lead pipe, asked for a trial of plastic pipe.

Plant Engineer Gerry Scheyer (of Adamas Carbide) offers this advice: "Whenever I ask for something, I approach it as a solution to a problem that faces management. Then I make a point of offering as many options as possible. Point is never to back management into a corner. That's what you do when you suggest only one way to solve a problem. That way, the president can say only 'Yes' or 'No.' If it's 'No,' the door is closed. If you offer him three or four possibilities, there's a chance for a compromise."

6. Take the boss to see for himself. The appearance of a rundown machine speaks far more eloquently than you can. More than one plant operating executive has sold his plea for modernization by getting the financial committee to come down on the shop floor and take a look. "You can show your boss more about equipment and buildings than you can describe in a report," says Ralph E. Williams of De Laval Separator. "That's what I did when we bought a battery of Gisholts for over $300,000. I could point out how poorly the old machines were doing on our product finishes."

7. Keep trying. If you give up too easily on a request, top management may feel that even you don't think it's too important. Persistence always pays off if your proposal is a good one. "For a difficult project, we surround 'em. We just have to wear 'em down," says P. E. Schaffer, works manager of Warner & Swasey Company (Cleveland).

"I start slugging for what I want as early as April so that when budget time rolls around, the company is conditioned to the proposal and ready to approve it," one plant engineer told us.

8. Watch your timing. Higher management's attitude toward expenditures is sensitive to changes in its cash position. It's obviously unwise to push for a difficult item, or one with dubious tangible savings, just when there's a profit squeeze. But it's also important to try to time your sales effort to other conditions in your company that affect the cash picture.

For instance, one works manager in an eastern shop told FACTORY editors: "At close of our fiscal year our company has a better picture of how taxes will affect its retainable earnings. If I have some particularly attractive proposal in my desk drawer, I drag it out a month before the year's end, hoping the president will take another look at it—then act quickly to get the expenditure into this year's records."

9. Ask only for essentials. If you must have frills, better bury them pretty deep. Because little extras that are nice to have but not absolutely necessary may tab your proposal as a pork-barrel project. The general manager of a large department of a major appliance manufacturer in the Midwest makes this point: "Especially in modernization proposals for building or service improvements, we face the argument of low benefits versus costs. Plushness that isn't required makes this low benefit stick out like a sore thumb. And often kills the proposal."

10. Choose the right words. This may sound too subtle, but don't overlook its influence. There are certain words or phrases that cause certain men to see red —or to smell a rat. If your boss, for instance, is unenthusiastic about a particular proposal, he may seize on an unhappy choice of words as an excuse to turn the request back. You may stress "cost reduction" when his pitch is "profit improvement." Or you may touch on a subject that's anathema to him—such as citing "improvements in labor relations," when his viewpoint is "we won't spend money to placate the union."

Think this problem is overrated? Not according to the people FACTORY spoke to. For instance, John Mulvaney, production manager for General Aniline & Film Corporation's Dyestuffs & Chemicals Division plant (Linden, N.J.), says he rarely gets into trouble with regard to technical accuracy or soundness of proposals, but he has a lot of difficulty at each stage because of minor "fiddling with the words."

Robert Caplin, chief cost accountant for GAF's Linden plant, substantiates this opinion: "We take pride in getting our proposals approved and are unhappy when one is bounced back, even though our batting average is about 98%. The biggest reason for proposal returns is language. We clean up the expressions and shoot them back again."

11. Lay some groundwork in advance. Cold-turkey selling for plant operating people is just as hazardous as it is for vacuum-cleaner salesmen. Each project benefits from careful advance work to soften up those whose approval is needed.

The general manager of a chemical company told us that missionary work was the secret behind his ability to sell the board on major projects: "We've recently decided to get a big computer to control a major process in one of our plants. It will cost $25,000, so we've got to be sure we're making a good case for it. To me, it's a matter of missionary work. We're constantly talking about the project with our higher management in informal lunchtime consultation and at full-scale conferences. The top boys seem agreeable so far. We'll make our formal presentation in a few weeks, and I think it's going through."

In a smaller company the plant engineer told FACTORY: "You must plan your campaign in detail. That's the philosophy behind the monthly report I send to the president. It opens up a continuing channel of com-

munications to influential people. And leaves me an opening to blow my horn when I want something."

12. Use a "sounding board." Try your proposal out on someone else before you make a formal presentation. GAF's Dyestuffs & Chemicals Division provides an Economic Evaluation Group to serve such a purpose. This group consists of three process engineers. The plant or production manager at any of the division's four plants may call on this group for aid in making preliminary analysis of more elaborate proposals. They don't do the complete and detailed study, but they provide what the company calls "high spot estimates." If the estimate of the project looks good, then it's passed on to the engineering department to get complete and detailed information.

A simpler sounding board is used by the manager of methods for a large eastern rubber company. He says: "Convince five people before formally submitting the proposal. If you can sell the foreman, general foreman, superintendent, factory manager, plus one other interested party, your proposal will probably go through." Who is the one other person? The "sales manager, purchasing director, or almost anybody. Point is that you have to get a lot of people into the boat before you put your proposal into writing."

13. Get the sales department on your side. Your proposal stands the best chance for running the gamut successfully when it has many supporters to ease it through the tight places. One of the most helpful—or most difficult if it is against it—groups is the sales organization. At Miller Brewing Company (Milwaukee) W. H. Beer, manager of production and engineering, reports that the brewery's strong sales pitch for high quality makes any proposal with a strong quality control element easier to sell up the line.

14. Try a different approach. If the first attempt isn't successful, perhaps another try with different emphasis will make your point.

At an Ohio electrical manufacturing plant, the division superintendent cites this example: Some ten years ago a proposal to alter machines that insulate lead wires was turned down because of low profit returns. With the passing years it became apparent that the old cost basis was no longer valid. So last year the superintendent tried the proposal again. He sensed that it wouldn't go through on the same old grounds because management's memory is long. So he ran a check of the present machines' effect on operators' hearing. Results indicated that hearing was being impaired by the sound of the extrusion coming out of the machine. By changing the pitch of the proposal from cost to worker health, he succeeded in getting an okay—even though cost reduction was equally important.

15. Be direct when the situation calls for it. Everybody seems to agree that the proposal should be simple, with expected results highlighted right at the beginning. "We use common arithmetic," says Vic Mills, general manager of manufacturing for The Sherwin-Williams Company (Cleveland). "We just show that we'll get lower cost, faster production, or higher quality."

16. Classify the reason for modernization. It's smart to make it clear right from the start what sort of request the proposal is—whether it's for profit protection or profit improvement.

At Republic Steel Corporation (Cleveland) General Manager M. E. Goetz says: "There are two things that make a proposal acceptable: necessity and savings. If we must have new equipment to meet our goals, that's necessity. For example, a tractor of ours caught on fire and we had to have another one. A table in the rolling mill won't run; even if it costs $200,000 to replace it, we still must buy one.

"As to savings, if we can show that we can cut costs or improve output, then we've got a savings argument. A modern crane can do a lot more than steam equipment in improving unloading costs and lowering repair bills, for instance. So we get a modern crane."

17. Sell it piecemeal. We don't mean you should try to sneak a project past the approval committee by breaking a large item up into smaller pieces. Most companies have caught onto this and are careful to guard against it. (As at a large assembly plant, where a quarterly accumulation of non-budget items is not permitted to exceed 5% of the total quarterly budget.) But the smaller-item approach does help to look far enough ahead into a project—like relighting the plant—so that it can be done over a period of years according to plan. Taken a few thousand dollars at a time, the proposal may be palatable. In a one-year lump the budget probably can't swallow it.

18. Don't depend upon the proposal to sell itself. The backwashes are full of plant operating people who have assumed that a well-written proposal report would guarantee approval. In addition, there's the personal touch to consider.

"Don't assume that higher management reads your recommendations thoroughly," advises the plant engineer in one company that does not have a formal appropriation request system. "In the case of a machine that I had reported on and suggested for replacement, I got no action. Then at the company picnic the machine operator talks to the company president over a couple of beers, says: 'That machine I operate is a real dog. If I had one of those new Brown & Sharpes, I'd turn out twice the stuff I do now.' First thing I knew about it was when I was called into an executive committee meeting to answer about the condition of the existing machine. I was happy, of course, that I could refer to my report."

19. Slant your idea toward the big picture. Too much obsession with operating problems, to the neglect of sales, finance, and other administrative matters, may brand your proposal (and you) as narrow.

B. J. Quinn, production manager for Chas. Pfizer & Company, Inc., observes: "Local plant management needs to uncloister itself, take a broad view of business in analyzing its modernization ideas. It needs to orient its considerations and decisions to the business as a whole, instead of merely to the technical area of operations."

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PLAN '59
MANAGED MODERNIZATION

Your proposals get the cold shoulder from your finance men? Maybe you're asking for it. If that's your trouble, here are three rules for . . .

Winning an Okay From Money Men

YOU'RE ON THE CARPET. The finance manager has your proposal for modernization in front of him. He's full of questions: "Will this new equipment really pay out in 10 months?" "Why is it better than what we now have?" "What's the alternate plan?"

As a plant operating man you've been through enough sessions like that to last you a lifetime. But you're not through. Not by a long shot. Believe the man who knows. Believe the finance manager himself.

FACTORY asked leading financial men how plant operating men fail in making requests for capital funds. The cartoons (right) tell how the operating man fails—in the finance man's view.

Then—seeking to find what makes the finance man tick—FACTORY culled the interview files that our editors compiled in a cross-country survey of modernization. You'll find how the money man thinks on the next page—in a synthesis of hundreds of impressions and remarks made by both operating and financial men themselves—as well as a summary of the personal traits and attitudes of the finance man. This profile should help you in your future dealings with the men who control the purse strings.

It all comes down to three simple rules that will help get your proposal past the finance manager.

1. SEE WHAT YOU'RE DOING WRONG

Here, in the words of the finance man himself, is how you go wrong in your approach to him:

You need more facts—"The operating man just doesn't have enough basic facts. Even if he misses a small point, he shakes my confidence in his whole proposal. I think he should put more emphasis on what the proposal will do in dollars and cents."

You take the narrow view—"The operating man doesn't see there's a limit on money. He fails to investi-

By E. W. ZIEGLER, FACTORY

MANAGED MODERNIZATION *Begins on page 105*

gate the need for a project. A supervisor decides, 'We need a new sheeting machine,' but top management asks, 'How much longer will we need one at all?' "

You ask for too much—"The operating man builds a plant or warehouse too big—with too much room for expansion. Then when we want to increase capacity we're obligated to stay at the same place until the plant is working most efficiently."

You forget the long run—"Plant men get obsessed with buying a machine with lowest capital cost. A machine that costs 50% more may really be cheaper—in longer life expectancy, lower labor cost."

You're no showman—"The operating man just isn't aware of the possibilities of visual presentation. He ought to give us graphs, charts—something we can grasp quickly. When he puts his conclusions on page 20 of a 20-page proposal, I may never get to page 20. I'll probably be asleep."

You're too timid—"Our men are just afraid to ask for funds . . . and they're plain bad on judgment. What it boils down to is this: The so-called practical man isn't very practical when it comes to financial matters."

You aren't clear—"We often have to take the proposals of our operating men apart to find out what they're talking about. If our men have one glaring fault, it's that they just aren't clear."

You ignore intangibles—"The plant man fails to document facts beyond his own limited production interests. Once he's answered the question 'How many pieces will this machine produce?' he forgets the intangibles."

2. LEARN HOW MONEY MEN THINK

"How much can we lose?" he asks. "Look how much we can gain," you say. That's the key difference between the finance and operating man. Although it won't come as a surprise, always remember that the financial man tends to be conservative, almost by job definition. He's dealing with the life-blood of your company. The finance man can't call back the misspent funds that a bad financial decision dumps out the window in the same way that you might correct a production mistake.

Your man, then, is likely to be a man of few words. May have a permanent scowl etched in his features. May seem aloof and hard to please—even grouchy.

There are good reasons for the finance man's antics—four good reasons, to be precise. The finance man is juggling four balls at a time: He has to have detailed, up-to-date information on both income and outgo. He has to forecast and budget for the future. He must establish the financial policies to guide himself and the business. And he must maintain financial control.

The finance man is concerned with the over-all profitability of the business—with risks, with return on investment, with fixed and variable costs, with taxes, government regulation, depreciation, inventory, cash flow, and a score of other considerations.

So if your treasurer seems preoccupied and inert, remember the host of factors that compete with your proposal for his attention. Another thing to bear in mind: At no time since the last days of the Great Depression has there been a more unfavorable ratio of cash to current liabilities than right now. Since 1947 corporate cash and security holdings have risen only 31%. Sales meanwhile have doubled. The finance man, in this time, has had many a lesson in the delicate art of running the business on less and less cash.

Your proposal for a capital expenditure challenges the company treasury's natural interest in keeping the bank balance at the optimum level. The finance man does want to cut idle cash to a minimum, yet there is still the irreducible minimum that he must have.

Therefore your proposal runs smack into the treasurer's forecasts of cash flow—an increasingly important method he uses to insure best possible use of every dollar at the company's disposal.

To give you an idea of the extremes to which some treasurers are going to insure maximum usable cash assets at any time, take the case of one large company with district offices all over the country. At one time district field offices requisitioned funds once or twice a week. Now the treasurer requires daily requisitions, thus keeps some cash at headquarters for current use as much as four days longer. Sounds minor—except that this company figures it frees a sum of money which, if invested for a year at 3%, would yield $43,000 income.

3. MAKE IT EASY TO COOPERATE

Take this case history of a large Eastern metal-working plant FACTORY visited recently. Late in 1955 operating men made a study and concluded that they needed six new vertical boring mills to keep quality up and to meet other competitive standards.

The operating men carefully assembled all the information they thought they'd need. By the spring of 1956 they were ready to make the pitch.

One important consideration they did not overlook in making their presentation was the probable lead time on delivery of the new mills. As it turned out, this made the treasurer's control of cash flow easier. Here's how:

By November of 1956 the finance committee had studied the proposal, okayed the purchase of the six new machines on the 1957 budget at a total cost of $300,000. Then the treasurer began plotting probable time of delivery against cash flow, to assure no wasteful excess of cash in the delivery period.

The schedule agreed on by supplier and the company was for one machine to come in June 1957, two more in August, and one in November. The last two would come in early 1958. Thus the treasurer knew he had to have $50,000 on hand for June delivery, $100,000 in August, and another $50,000 in November. The last $100,000 would not be needed until the next year.

The added flexibility this schedule gave to the treasurer's cash-flow calculations made it easy for him to get maximum use out of his funds and to save the company the needless cost of an excess of idle cash or the opposite waste of short-range borrowing from other sources.

This sort of teamwork between operations and finance is essential to high efficiency, but it doesn't come easily. Both you and the finance men have the job of trying to imagine yourselves in the other's shoes. As one operating vice-president puts it: "The operating man has to be half accountant to carry a proposal through." Follow that advice and you'll find an occasional smile playing on those care-worn features of your finance man.

no more knuckle-busting . . .

New RIDGID No. 450 Portable Tristand Chain Vise

has Large Easy-to-Operate **Top Screw Handle** right up on top

Capacity, ⅛" to 5"
Weight, 42½ Lbs.

Here's a real time saver. Not only do you get a complete work-bench that's truly portable, but now you get a chain vise that's extra easy and fast to operate. Handle is right up on top where it's always handy. Handle and tightening nut are anchored to vise base . . . can't pull out.

Vise base, that overhangs front legs for clear tool swing, has hanger slots for tools, 3-size pipe bender, rear pipe rest and adjustable ceiling brace screw. Folding legs and integral tray set up easily and lock in position for rigid work base. Snap chain holds folded legs closed for easy carrying . . . no loose parts. Rubber grommets in tristand feet prevent creeping. See and try this more-for-your-money RIDGID Top Screw Chain Vise at your Supply House!

New RIDGID Bench Chain Vises
have same Extra-Efficient Top-Screw Adjustment...

5 Sizes, for ⅛" to 8" Pipe, Conduit or Rod

The Ridge Tool Company • Elyria, Ohio • U. S. A.

EQUIPMENT NEWS

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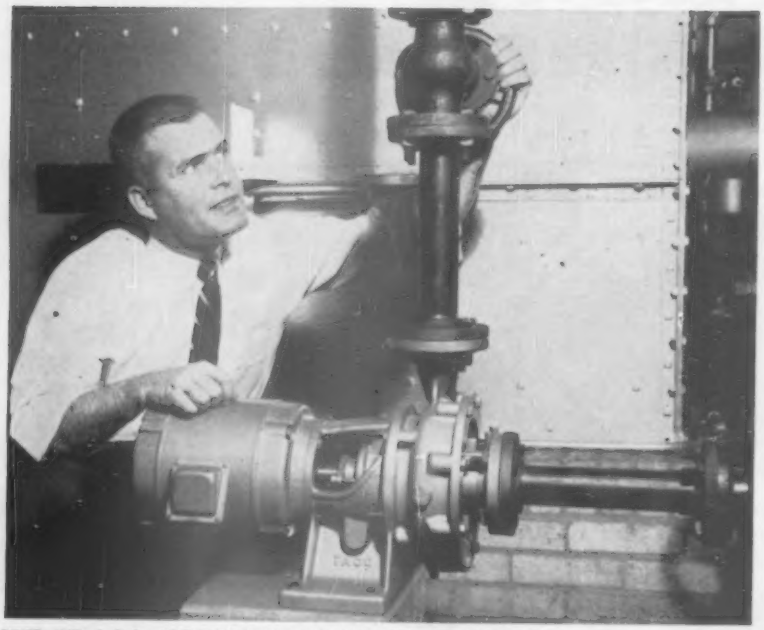


USE OF A.S.A. "PREFERRED NUMBERS" RESULTS IN . . .

"Integrated" Line of Pumps

For the first time, an American manufacturer has adopted the American Standards Association "preferred number" designations as the basis for standardizing a complete line of single-stage centrifugal pumps, called Series LP.

Applying the "preferred number" series to pumps means head developed by each successive model in the series exceeds that of the "next lower" model by a factor of 1.6 to 1; flow rate (in gpm.) of successive models is 2 to 1. Result of using this new standard is said to be greater opportunity than ever before for precise matching of job and pump to obtain best operating economy.

Range that will be covered by the new line (not all models are available yet) is from 12 gpm. at 12-ft. to 2500 gpm. at 230-ft. head.

Taco Heaters, Inc. (Circle 101, Reader Service Card.)

102—Line of Power Brushes can do jobs of rotary files, abrasive belts, tumbling machines. New brushes can rough up leather, rubber, synthetics; remove rubber or plastic flash from molded parts; strip insulation; produce a variety of surface finishes. *Osborn Mfg. Co.*

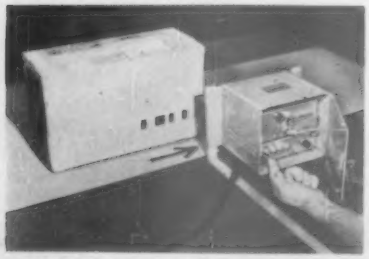
103—Handy Parts Tray with adjustable dividers hooks on pegboard above working area, keeps small parts at your fingertips. The curved steel tray is 18 in. long, 3 in. wide, 2 in. deep; small hooks on back quickly slip into pegboard slots. *Industrial Marketing Service.*

104—"Multi-Color" Spray Unit uses an array of variable-speed electrostatically charged atomizers which blend coating materials to produce multi-color mixed patterns as well as single-color finishes. Reciprocating and stationary models. *Ionic Electrostatic Corp.*

105—Carton Crusher consists of two heavy-duty powered belt conveyors, one mounted above the other, with surfaces facing. Unit breaks down walls of a corrugated carton, reducing rigidity and bulk—and thus makes baling a faster operation. *Rapids-Standard Co., Inc.*

106—Small-Parts Counter-Batcher is a complete electronic unit for feeding, counting, and batching small items. Portable device (53 in. long, 12 in. wide) will feed and tabulate 300-1000 pieces/min., "batch" count in any desired total to 1-million. *Post Electronics.*

107—Transistorized Speakerphone design completely eliminates bulky control box and 110-volt power requirement of loudspeaking telephone installations. Unit is installed like a standard telephone and is powered by current from telephone line. *Automatic Electric Co.*



108—Carton Selector photoelectrically counts and sorts any of 30 different-size boxes moving along a conveyor or similar line at speeds to 180 fpm. Selection is by means of a 5-bar code printed on cases. Perfect orientation isn't necessary. *Atronic Products, Inc.*

109—Adjustable Utility Bench serves all around the plant as a workbench, loading table, assembly line table, storage table or desk. It is adjustable in height from 26 to 35 in., in length from 25¾ to 43¼ in., and is 26 in. wide. All members are heavy-gage steel. *Morrison Products, Inc.*

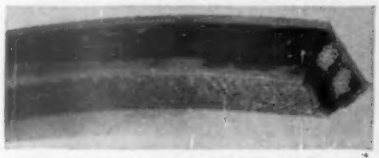
110—Plastic Kemhut comes as compact 150-lb. package, quickly erected into a 10-ft.-wide, 12-ft.-long, 7-ft.-high storage building. Curved, shatterproof plastic panels need no internal bracing, no foundation—and unit is rot-proof, rust-proof, watertight. *Kemlite Corp.*

Turn the page

B.F.Goodrich V belt briefs

TIPS ON THE CARE, MAINTENANCE AND SELECTION OF V BELTS FOR INDUSTRY

What caused this V belt failure?



Appearance: V belt sidewall and bottom worn away.

Cause: Abrasion. Foreign material and rust in sheaves wore away sidewalls, causing belt to drop to bottom of groove.

Prevention: Use dust guards to protect against abrasion.

Use canvas covers to protect adjustment bolts

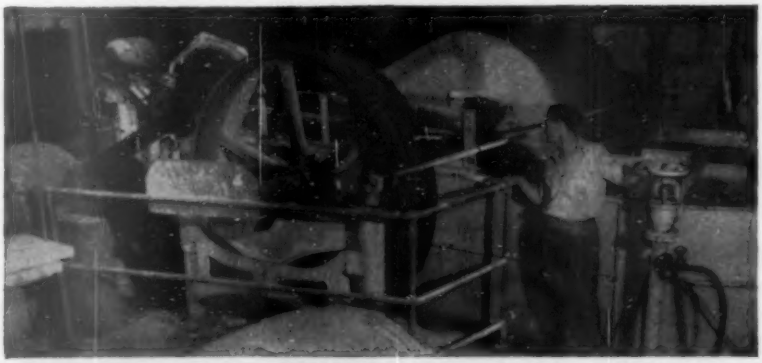
Rusty or corroded adjustment bolts at motor base make it difficult to adjust or install a V-belt drive. A simple way to overcome this problem is to cover bolts with a piece of heavy canvas. Then when an adjustment is needed, just lift up the protective canvas cover—adjustment bolts and locking nuts work like new.

HERE'S WHY GROMMET BELTS GRIP BETTER—*See all the rubber surrounding the twin grommet in this B.F.Goodrich belt? It has more rubber in relation to belt size than any other belt. Because the grommets are endless, have no stiff overlapping cords, they are more flexible, grip the sheaves better. Size for size, Grommet belts give ⅓ more gripping power with less slip. This stronger, more resilient construction gives the B.F.Goodrich Grommet belt 20% to 50% longer life. Yet it costs no more than ordinary belts.*

What do V belt sizes mean?

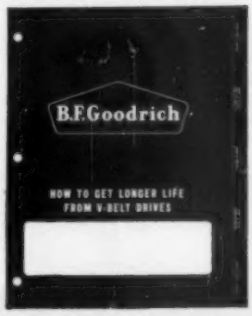
V belts are marked with a letter which indicates their width across the top and a number to indicate their length. Standard belt widths are coded: A (½″), B (21/32″), C (⅞″), D (1¼″), and E (1½″).

All high capacity V belts will be identified by the addition of the letter "P" as soon as present stocks are used up. For example, AP, BP, CP, DP and EP.



A BELT SNAPPER—*This pulp mixer in a paper plant runs 24 hours a day, 7 days a week. Belts used to drive the mixer couldn't handle the job. Motor bearings were burning out, belts were snapping under the shock load. Then a B.F.Goodrich distributor suggested Grommet belts to stand the jerks and hard pulls. When this picture was taken, belts had been installed nine months and are still going strong.*

B.F.Goodrich V belt manual



Your B.F.Goodrich V belt distributor can give you a new maintenance manual that tells you how to get longer life from your V belt drives. Its 12 illustrated pages contain information on how V belts work, how to select V belts that fit, how to install, how to keep them running, and how to spot trouble.

Ask a factory-trained specialist

For help in selecting V belts for any kind of service, call the man who is a specialist in V belts—your B.F.Goodrich distributor. He can help you cut costs by getting longer life from your V belt drives. *B.F.Goodrich Industrial Products Company, Dept. M-468, Akron 18, Ohio.*

B.F.Goodrich V belts

For more facts circle 509 on Reader Service Card

For more about these items, circle numbers on Reader Service Card next to back cover.

IT CLEANS QUIETLY, WITHOUT RAISING DUST. IT'S A NEW . . .

De-Rusting, De-Scaling Pistol

Operating on compressed air, this lightweight pistol is a handy tool for de-rusting, de-scaling, cleaning, and preparing surfaces of practically all materials. The tool excels for cleaning uneven surfaces —hard-to-reach crevices, niches, or grooves. It effectively cleans hard surfaces such as steel, stone, or concrete—even cleans resinous coatings. It's fine for cleaning weld seams, for paint stripping, for raking joints, for rough-up jobs. Shown above, it's performing a wall-cleaning job on concrete.

Here's how it works:

Compressed air from any compressor hammers the hardened steel needles so that they pound the contour of the surface being cleaned—thus rapidly removing scale and rust from even the most inaccessible points. (Special adaptor heads may be used if required). The action is controlled by a trigger on the handle. Air continually blows over the working surface, leaving the surface visibly clean. Normal working pressure is about 90 psi. and air consumption is about 13 cfm. Operation is quiet—and the tool never heats up on the job.

Pistol comes in three models, largest of which weighs 13 lb. Three sizes of needles in two styles (chisel point and flat head) are offered for varied jobs.

The Marindus Co. (Circle 111, Reader Service Card.)

112—Concrete Patch Kit for repair of floors, driveways, and masonry is a two-part epoxy-based concrete ("Epocrete") that cures at room temperatures with almost no shrinkage. Adhesion to steel, concrete, and wood is said to be more than 1000 psi. *H. V. Hardman Co., Inc.*

113—Condenser is a combination air-cooled, water-cooled unit: Operates as normal air-cooled condenser up to selected ambient temperature; adds water-cooling above this temperature. Water side handles entire condensing load if air-cooled system fails. *Dunham-Bush, Inc.*

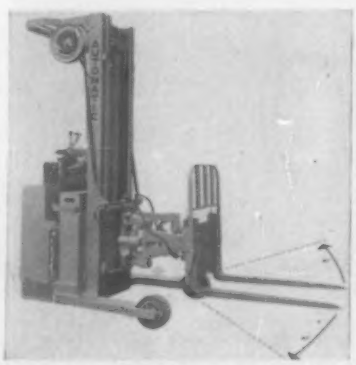
114—"Allispede Drive" is a mechanical adjustable speed drive that offers infinitely adjustable speed over ranges up to 8:1. The drive operates from an a-c power source and is available in ratings from 1 to 20 hp. with output speeds to 10,000 rpm. *Louis Allis Co.*

115—Package Nitrogen Generator is fully piped and wired to produce 99.99% pure nitrogen by combusting a mixture of air and natural or manufactured gas. Unit produces dry, CO_2-free atmosphere; can be operated to eliminate all combustibles. *Lindberg Engineering Co.*

116—Portable Cable Splicing Stand (H Frame) can be set up or knocked down by one worker in two minutes. Stand folds to a compact 16-lb. package. Holds all types of electric cable up to 3 in. dia. under tension at convenient working height. *Austin Powder Co.*

117—Quick-Reset Revolution Counter handles speeds up to 6000 rpm. or 8000 counts per min. Flick of the lever through a 60-deg. arc resets the 5-digit counter to all zeros; large figures provide easy reading. Dimensions are: 5x2⅝x2$^{13}/_{16}$ in. *Veeder-Root, Inc.*

118—Liqui-Dial Control uses hydraulic pressure to actuate up to 36 remote valves from a single location, turning them on and off in any pre-set sequence. Control is available in two styles, one with 6 dial positions, the other with 12. *Automatic Valve Systems Co.*



119—Swing Reach Truck projects forks forward to "reach out" for the load and swing in unison, right or left of center up to 30 deg. No need to position truck to pick up load since forks have 60-deg. "swing" radius. Capacities to 4000 lb. *Automatic Transportation Co.*

120—Tool Transport Truck can be pushed to job, even up and down stairs, fully loaded. Truck is tipped backward just enough to balance on large rear wheels; or can be rolled on all four wheels to maneuver around obstructions. Net weight: 100 lb. *Snap-On Tools Corp.*

Turn the page

new

EC&M

"VL" AC CRANE CONTROL

for light industrial* crane service

Form VLRP Reversing Controller with Frequency Plugging Relay

• Designed specifically for light industrial AC cranes, EC&M's full magnetic "VL" control assures smoother, more efficient operation than manual control. On cab-operated cranes, operators have greater freedom of movement with small masters mounted up-front and controllers at rear of cab. "VL" control is also available for cranes operated from floor by pendant push-button master.

EC&M "VL" Controllers are compact and have vertical-action type contactors. The well-known EC&M Frequency Relay provides accurate control of accelerating operations on Dynamic Lowering hoists. Timed acceleration is provided for Reversing hoist, Bridge or Trolley controllers. "VL" controllers have "individual protection," eliminating the need for separate protective panel. They are front-connected and wired for easy inspection and maintenance.

A companion line to EC&M's "PT" Control for DC cranes, this new "VL" control is far superior to manual control previously specified purely on the basis of price.

*NEMA Service Classification II applications

Write for Bulletin 6431 for complete details

THE ELECTRIC CONTROLLER & MFG. CO.

A DIVISION OF THE SQUARE D COMPANY

CLEVELAND 28 • OHIO

1587

FLEXIDYNE
THE DRY FLUID DRIVE
100% efficiency at full load!

TAPER-LOCK
STEEL CONVEYOR PULLEYS
Maximum strength with minimum weight!

ROLLING GRIP
FRICTION CLUTCHES
Positive! Smooth! No toggles!

•

Write for Bulletins!

- Flexidyne Dry Fluid Drives and Couplings. Bulletin A-640-A.
- Taper-Lock Steel Conveyor Pulleys. Complete data. Bulletin D-56.
- Rolling Grip, Diamond D, Air-Grip Clutches. Bulletin D-56.

DODGE MANUFACTURING CORPORATION
400 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

For more about these items, circle numbers on Reader Service Card next to back cover.

121—Metal-On Pipe Insulation (for temperatures to 1200 F.) provides Thermobestos calcium silicate pipe insulation and an aluminum jacket in a single package. Both insulation and jacket can be installed in one operation, in about 90 seconds. *Johns-Manville Sales Corp.*

122—Trash Pick-Up Unit, using 8-in.-wide scoop, cleans large open areas of débris. Using hose, it gets into hard-to-reach spots, without hand sweeping. Litter is shredded and blown into canvas bag. Hose also acts as fresh air blower to confined spaces. *Arrow Sales Co.*

123—Drum Vacuum Cleaner attaches to any standard open-head 55-gal. drum to give a full pick-up capacity of 48 gal. dry or 40 gal. wet material. Unit is powered by a 1¼-hp. motor, sealed against dirt and water. Emptying the cleaner is a simple and speedy process. *Black & Decker Mfg. Co.*

124—Miscut Gage measures length of steel sheets moving along a conveyor belt at up to 50,000 fpm. and rejects short or long sheets. It can provide accurate dimensional control for other metal, plastic, paper, or textile fabrication processes. *Eldorado Electronics.*

125—Moto-Bug R-18 model can carry 3000 lb. in an 18-cu.-ft.-hopper. As a forklift (at 15-in. load center) new model will raise 1500 lb. to 7 ft. Operator can tilt the forklift mast 10 deg. back—2 deg. forward. Engine is side-mounted. *Kwik-Mix Div., Koehring Co.*

126—Keyless Chuck, dubbed "Precisionist" by makers, is intended for use on production lines and in toolrooms where close tolerances are a must. Ball-bearing construction assures a firm grip on cutting tools. Offered in ½- and ⅝-in. capacity. *Supreme Products Corp.*

127—Fluorescent Ballast, completely weatherproof, is guaranteed against service failure due to weather conditions for 2 years. New models—all in one-case construction—are ideal for area lighting and available for 800-, 1400-, and 1500-ma. lamps. *Jefferson Electric Co.*

128—Recording Potentiometer can measure any number of variables—handle from 2 to 24 points—by means of a low-cost kit of changeover parts. Field changeover takes 3 min.; operator merely changes a plug-in unit and replaces dial indicator and print wheel. *Daystrom, Inc.*

129—Temperature Monitor uses scanning control for measuring temperatures from —200 to +3000 F.—handles up to 24 stations in sequence. Abnormal condition at any point is instantly indicated by a warning light, and by an alarm if desired. *Assembly Products, Inc.*

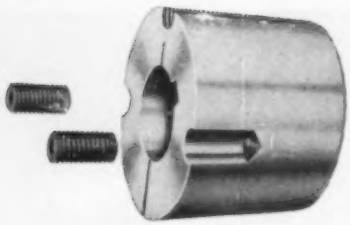
130—Comparator checks the clearances between the ID and OD of mating parts to millionths. The new comparator is designed for checking precision mechanisms, such as servo valves, where clearances are kept to a few millionths of an inch. *Pratt & Whitney Co., Inc.*

131—Dynamotive Fork Truck, gas-powered and electric-driven, is offered in 4000- to 10,000-lb. capacities. Gas engine transmits power through a variable voltage generator, for fuel savings reportedly up to 30%. Truck's travel speed is 8½ miles per hour. *Automatic Transportation Co.*

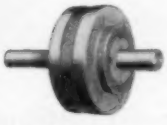
132—Boltless Steel Shelving, fast and easy to install and adjust, features new design channel clip. Male part of clip has two T's that insert through holes in the upright angle post; female unit slides over the T's, clamping both parts firmly in place. *Penco Div.*

133—Grid Magnet effectively removes ferrous contamination from grain, chemicals, similar free-flowing materials. Available in both single bank or drawer type, the magnet is easily customed to chutes or hoppers of any shape, and is easily cleaned. *Magni-Power Co.*

Turn the page



TAPER-LOCK Bushings are *Interchangeable!*

Change from shaft to shaft				
Change from size to size				
Change from sheaves to sprockets to couplings to conveyor pulleys				

● *Save Time!*

There's nothing like Taper-Lock for mounting wheels on shafts! First, you get off-the-shelf convenience. No reboring, no machining, no waiting!

● *Save Work!*

You get the holding power of a shrunk-on fit with minimum effort. Product and bushing slip on the shaft as a unit. Tighten the screws—and you're set!

● *Save Money!*

You save big money by minimizing down-time with *quick* changes. And interchangeability minimizes inventory. Note that all of the above installations are handled with a total of only four bushings—all with the same outside diameter!

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer".

DODGE MANUFACTURING CORPORATION, 400 Union St., Mishawaka, Ind.

MOVE THE MIND

. . . AND YOU MOVE THE MAN!

Employee cooperation comes faster when the approach is visual. Easier-to-understand, because—"it can be seen" is the keynote in today's fast tempo. Aimed directly at the important work level, Elliott Hi-Vision employs all the known persuasion power of dramatic eye-appeal. Your Management objectives are more readily reached because this strong approach:

- Defines the problem
- Clarifies the goal
- Encourages personal participation

Elliott Hi-Vision reaches and conditions more minds more often than any other in-plant approach.

ELLIOTT SERVICE COMPANY, INC.
Dept. 1, Mount Vernon, N. Y.
Please provide me, without obligation, further information and multi-color samples of your Hi-Vision Program.

Name_____
Firm_____
Address_____
City_____ Zone____ State_____

FACTORY/EQUIPMENT NEWS

Begins on page 108

For more about these items, circle item numbers on Reader Service Card next to back cover.

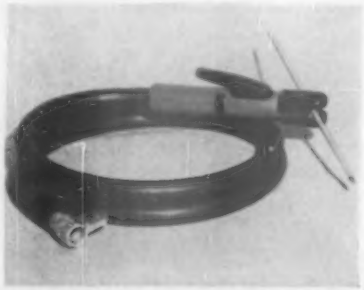
134—Bench Counting Scale (small Model 1743) speeds up stock taking, parts issuing, order filling—adapts to straight-count or weigh-count operations. Quantities up to 200 lb. of small bulky parts can be counted quickly, within accuracy of 1 oz. *Detecto Scales, Inc.*

135—Out-Size Load Truck is a modified version of gasoline-powered G-3 model, specially built to handle cumbersome loads. The 48-in. load center permits transporting and stacking 10-ton loads that extend 8 ft. out from face of fork carriage. *Yale & Towne Mfg. Co.*

136—Recycling Air Dryer provides a continuous supply of dry air in a closed system at a rate of 900 cfh. at 3 lb. pressure per sq. in. and minimum dewpoint. No compressed air is required since "Dynadryer" includes a built-in air pump. *United States Dynamics Corp.*

137—Hydraulic Power Check, in-line single-acting model, provides precise feed control of air cylinders and a variety of machine feed components. It will check thrust loads up to 1500 lb. and provides checking action on either forward or reverse stroke. *Appco Corp.*

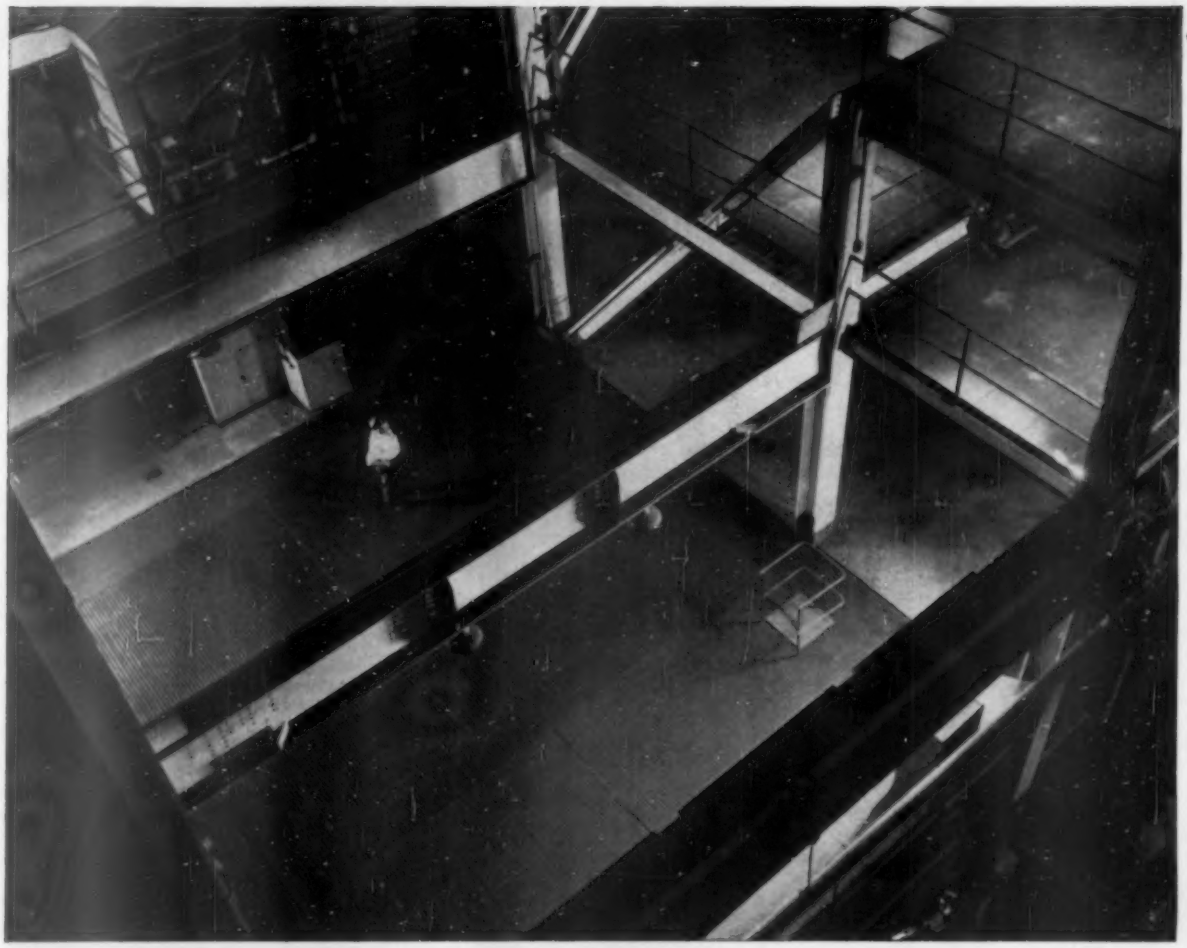
138—Storage Batteries for any model electric industrial truck pack up to 45% more power in a given battery container. Four new models in line incorporate armored porous tubing and several other new features. *Exide Industrial Div., The Electric Storage Battery Co.*



139—Metal Removal Torch is designed for light, intermittent maintenance applications throughout industry. New smaller H-2 models can be operated on as low as 40 psi., half the required minimum air pressure used by larger models. Price is about $50. *Arcair Co.*

140—Open Dry-Type Transformer using alumnium in all current-carrying components, provides quieter, lighter-weight units. Units are offered in 300-2500 kva. ratings; weight of a 1000-kva. unit is about 1300 lb., or 14% less than copper-wound unit. *General Electric Co.*

Turn the page



Blaw-Knox Electroforged® Steel Grating provides removable floors to simplify plant operation

Floors and mezzanines made of Blaw-Knox grating solve the problem of reaching, moving and servicing the largest types of equipment. Sections come up easily, allowing ample space to maneuver and maintain any size of machinery. Costly, time-consuming alterations are virtually eliminated.

For increased plant safety Blaw-Knox Electroforged Steel Grating provides rigid one-piece construction for sure support of the heavy loads. Non-slip cross bars and a wide variety of bearing bars assure safe walking and climbing — even under the most hazardous working conditions.

Because there's nothing to wear, or patch, nothing to catch and retain dirt, upkeep becomes easy and economical. And grating's maximum open area admits more air and light, makes brighter, better-ventilated plants.

Blaw-Knox Electroforged Steel Grating for walkways, stair treads and floors is fabricated to meet your specific operating needs. For new ideas about a complete line of space saving grating, write for Bulletin 2527 featuring grating and treads.

BLAW-KNOX

BLAW-KNOX COMPANY

Equipment Division

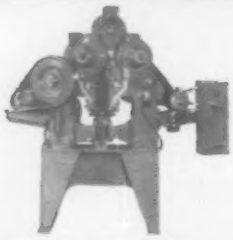
Dept. B, Pittsburgh 38, Pennsylvania

For more facts circle 514 on Reader Service Card

Speed up **RIVETING** and **CLINCHING**

Automatic feeding and setting with

T-J



RIVETS 4 AT A TIME! Special quadruple riveting unit, incorporating two Model "RR" Twin Rivitors, mounted on a special welded steel base. Equipped with air-operated hold down mechanism and a safety air trip arrangement. Tooled for riveting left hand and right hand automotive muffler bracket assemblies.

SPECIAL TWIN RIVITOR! Tooled for 6 station indexing fixture, incorporating automatic clamping and ejecting mechanisms, for riveting laminated armature assemblies

T-J CLINCHOR adapted to a wide range of clinch nut setting problems. Gravity Feed model shown here.

You'll realize *faster assembly . . . reduced labor costs* immediately, when you use T-J Rivitors and Clinchors for your production line. These performance-proved machines are designed to do a wide range of assembly jobs for aircraft, automotive, farm machinery—riveting jobs of *all* kinds.

T-J RIVITORS automatically feed and set solid rivets with high production. Electrically powered Rivitor sets solid steel rivets up to ⅞" long. Throat depths 8" to 36".

T-J CLINCHORS set clinch nuts with fully automatic operation, controlled by a single foot pedal. Available in Underfeed and Gravity Feed models, throat depths 8" to 36".

Send today for these helpful references: Rivitor bulletins 646 and 555 . . . Clinchor bulletin 555. The Tomkins-Johnson Co., Jackson, Mich.

T-J TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS

FACTORY / EQUIPMENT NEWS

Begins on page 108

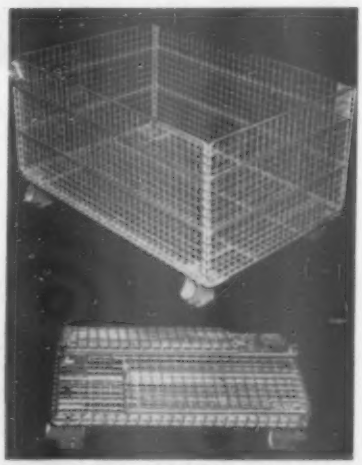
For more about these items, circle item numbers on Reader Service Card next to back cover.

141—Dual Screen Comparator allows operator to check precision parts in two planes at once—projector shows two simultaneous images through separate optical systems; offers cost advantage of simultaneous coordinate checking on high production parts. *Stocker & Yale.*

142—Mist Fog Collectors (Model VCS-2) include non-magnetic, spark-proof aluminum fans that reduce the danger from explosive or combustible vapors. Mistkop collectors themselves are completely fireproof, have suction capacities from 600 to 3600 cfm. *Aget Mfg. Co.*

143—X-Ray Control, offering range of 30-250 kv., can produce clearly defined images through ⅛-in. aluminum up to 4-in. steel. Kilovoltage is automatically compensated, regardless of current, to yield consistent radiography. *Westinghouse Electric Corp.*

144—Diffused Silicon Rectifiers for magnetic amplifier and power supply applications can be protected by low-cost standard commercial fuses (recommended rating: about 160% of RMS current) against short circuits, high surge currents, overloads. *Trans-Sil Corp.*



145—"Junior" Palletainers, like their larger counterparts, fold down to save up to 75% storage space. These steel wire mesh containers for small parts come in two sizes: 32x20x16 in. and 20x16x12 in. Weights are 38 and 24 lb. *Union Steel Products Co.*

146—Stud Pin Driver is a small, light hammer-tool for driving pins into concrete block, mortar, brick, or steel. It has only 2 parts—a handle grip and driver (no parts to lose or break). Sized to fit pocket, priced to fit pocketbook (about $6). *Fastway Fasteners, Inc.*

Turn to page 120

For more facts circle 515 on Reader Service Card

For more facts circle 516 on Reader Service Card ➤

There's NO other truck like AUTOMATIC'S NEW DYNAMOTIVE

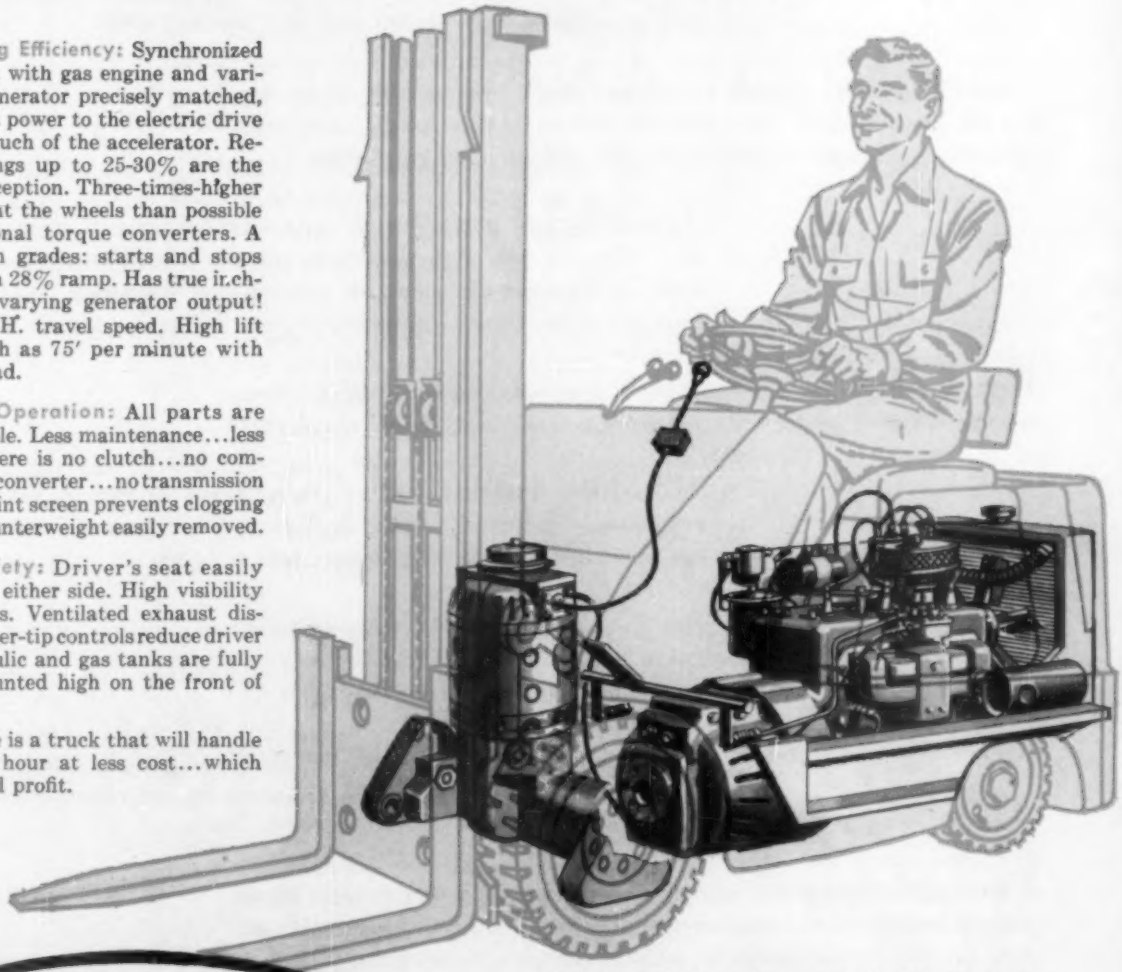
Offers the ultimate in High Operating Efficiency ...Low Cost of Operation...and Maximum Safety

High Operating Efficiency: Synchronized power package, with gas engine and variable voltage generator precisely matched, supplies instant power to the electric drive motor at the touch of the accelerator. Results: gas savings up to 25-30% are the rule, not the exception. Three-times-higher torque output at the wheels than possible with conventional torque converters. A power house on grades: starts and stops with full load on 28% ramp. Has true inching ability by varying generator output! Fast, 8.5 M.P.H. travel speed. High lift speed; as much as 75' per minute with 4,000 pound load.

Low Cost of Operation: All parts are readily accessible. Less maintenance...less down time. There is no clutch...no complicated torque converter...no transmission ...no trouble. Lint screen prevents clogging of radiator. Counterweight easily removed.

Maximum Safety: Driver's seat easily accessible from either side. High visibility in all directions. Ventilated exhaust dispels fumes. Finger-tip controls reduce driver fatigue. Hydraulic and gas tanks are fully protected—mounted high on the front of the truck.

In short, here is a truck that will handle more tons per hour at less cost...which means increased profit.



Savings are dynamic with the new Automatic® DYNAMOTIVE

AUTOMATIC TRANSPORTATION COMPANY
WORLD'S LARGEST EXCLUSIVE BUILDER OF ELECTRIC-DRIVEN INDUSTRIAL TRUCKS
Division of The Yale & Towne Manufacturing Company
Department W-8, 39 West 87th Street, Chicago 20

Get all the facts on this completely different truck. Dynamotives are available in capacities from 4,000 to 10,000 lbs. with cushion tires, and 4,000 to 6,000 lbs. with pneumatic tires. Write today for new bulletin!

AUTOMATIC TRANSPORTATION COMPANY
Division of The Yale & Towne Manufacturing Company
39 West 87th Street, Department W-8, Chicago 20, Illinois

- ☐ Please mail me complete information on the new Automatic Dynamotive.
- ☐ Explain convenient plans for lease or purchase of Automatic industrial trucks.

Name_____ Title_____

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City & Zone_____ State_____

FACTORY
MANAGEMENT AND MAINTENANCE

IDEAS OF THE MONTH

By LEWIS K. URQUHART, Consulting Editor

(For more information, circle item numbers on Reader Service Card next to back cover)

Your maintenance painters will sigh for, cry for Phoenix, a heavy-duty, high-production roller *(Bestt)*. Lambskin or synthetic covers in 9-in. size are mounted on 2½-in. solvent-resistant phenolic cores, which permit 50% more paint to be applied with each loading. **(291)**

Newest hand sanders *(Miller Falls Co.)* with tungsten carbide abrasive will last indefinitely. They work like a charm on wood, plastic, composition materials. Two models—medium (80 grit) and fine (150 grit). **(292)**

The Mark Family helps make small-lot automatic production feasible. It's a new line of packaged units *(General Electric)* designed to provide semi- or full-automatic control of point-to-point positioning. And to direct from one to five linear or rotary motions of a machine or machine tool. **(293)**

Hex wrench *(Ridge Tool Co.)* is a maintenance man's dream. Four-sided narrow jaw provides better leverage, makes work easy in tight places. **(294)**

Handiest ladder ever to meet these old eyes is Extend-A-Step *(Patent Scaffolding Co.)*. It's a stepladder. It's an extension ladder. It's a stairway ladder. Or it's two separate ladders. **(295)**

Copytron is a new electrostatic printer *(Bruning)* that makes permanent black-and-white enlargements of microfilmed drawings and records. At a cost of only a few cents a print. At a rate of about four per minute. **(296)**

Safety-message clock *(Electric Neon Clock Co.)* has a 66-in. illuminated shield around its top half, with room for any custom message of 20 letters and spaces. Can be read at 300 ft. **(297)**

Your cafeteria kitchen staff would probably give their eyeteeth for one of those new high-compression cookers *(Hotpoint)*. It goes to work in 45 seconds, can turn out two bushels of potatoes an hour. All the operator has to do is load the cooker, close the door, and set the timer. **(298)**

First man cooler that oscillates—first one we've seen, anyway—is a heavy-duty fan *(Robinson Ventilating Co.)* available in blade sizes from 30 to 42 in. Does the work of a couple of stationary fans. **(299)**

Best way to file drawings may be the pack interlock system *(Hamilton)*. It consists of 2½-in.-sq. containers that dovetail together to form any size or shape stack required—around pipes, under tables, in virtually any available space. Inner tubular receptacles hold drawings up to 2¼-in. diameter. **(300)**

Newest cleaner seems to be Action *(Octagon)*, which makes light work of the heaviest housekeeping tasks. Try it before repainting. **(301)**

Now it's packaged offices completely equipped with modular furniture *(Remington Rand)* and divider walls *(Hauserman)*. Both furniture and walls are available in compatible color combinations. **(302)**

Knee-operated version of thermostatic mixing valve *(Powers Regulator)* leaves the worker's hands completely free to hold or manipulate his work in industrial washing operations. Since he doesn't have to keep adjusting the temperature, his work goes faster, and he saves water. **(303)**

Dust-Master is a low-cost, portable dust-collecting system *(Cincinnati Fan & Ventilator Co.)* that fits any 55-gal. open-end drum. For wet or dry pick-up. Unit is all spark-proof cast-aluminum construction. **(304)**

Copyrama may be coming to your neck of the woods. It's a traveling exhibit *(Haloid Xerox)* of high-speed document reproduction. Scheduled for Philadelphia, Nov. 11-13; St. Louis, Dec. 17-19; Dallas, San Francisco, Los Angeles, Cleveland, and Detroit in early 1959. **(305)**

Working Safely is a neat little guide to plant safety *(Inland Steel)* that may give you ideas for a safety booklet of your own. **(306)**

Functional color kit *(Colorizer Associates)* includes a brochure illustrating colors recommended for specific plant areas. Also paint color chips identified by number and showing reflectance percentages. **(307)**

Braze-lok is a new fitting *(Parker)* for brazed tube connections. You simply insert tube in fitting and turn on the heat. Especially suitable for use in close quarters where space limitations rule out wrenches for mechanical threaded joints or welding equipment for welded connections. **(308)**

Fast-acting cold parts cleaner *(Permatex)* dissolves and washes away the toughest foreign coatings from metal surfaces. Immersion type. Composed of chemical concentrates under a water seal that prevents evaporation. **(309)**

Handling delicate equipment, other fragile loads? New floating-hub caster *(Bassick)* provides shock absorption for loads between 50 and 150 lb.—half the effective load range of previous casters. **(310)**

More Ideas of the Month in Press Time Report following page 72

How to "Turn on a Dime"

Today, production men must "turn on a dime" to meet changing output requirements. One day sales are off—machines are idle; the next equipment must produce at top speed to meet a rush order. This requires unusual flexibility in both men and machinery.

To help solve this problem, General Electric offers a new, packaged, adjustable-speed drive—the Speed Variator. Offering wide speed ranges and good regulation, it can help your machines produce a greater variety of goods, faster and at lower cost per unit.

Find out how this versatile new drive can help you keep pace with today's fast changing production demands. Write for GEA-6643. *Direct Current Motor and Generator Department, Erie, Pennsylvania.*

813-20A

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more about these items, circle numbers on Reader Service Card next to back cover.

147—Tube Type Polyphase Motors—totally enclosed, fan-cooled, squirrel-cage models—are offered in ratings to 500 hp. Efficient cooling is provided in the steel frame motors by series of tubes through which air is circulated by internal blowers. *Wagner Electric Corp.*

148—Three-Wheel Electric Truck can carry a 1000-lb. pay load, plus operator and passenger, in 50-in. passageways. Features hydraulic brakes and heavy-duty batteries with range up to 80 miles. Comes in orange or yellow color; all-weather cab is an optional feature. *Cushman Motors.*

149—Bin Level Control for bulk bins prevents overflowing, clogging, and choking in bins, conveyors, chutes, and other equipment. Switch in "Bin-Vue" level indicator controls any auxiliary equipment; unit features an easy-off cover and a fail-safe device. *Convair.*

150—"Tare-Out" Control System makes it possible to fill a variety of containers with exactly the same amount of material each time, regardless of the weight of each container. Each filled container is removed and cycle automatically repeated. *Richardson Scale Co.*

151—Pallet-less Clamp for maker's fork trucks has 1⅝-in. thick arms—reducing the arm entry space needed between stacked cartons and thus increasing usable storage area. Clamp picks up 1000-lb. unit loads directly off floor, without pallets. *Clark Equipment Co.*

152—Automatic-Filling Lubricator, in pipeline sizes ¼ to 1 in., maintains constant maximum-minimum oil level in lubricators. Lubricant is supplied by pipeline direct from 55-gal. drums at a central pumping station to any number of lubricators. *Arrow Tools, Inc.*

153—Inherently Protected Motors are for severe-duty cycle service such as air conditioning compressors. New line of 3-phase, small integral-hp. motors protects against excessive overloads, stalls, single-phasing, and high ambient temperatures. *General Electric Co.*

154—Automatic Loading Ramp is delivered "knocked down," to be assembled at installation site. Precision-machined and welded parts and subassemblies make assembly easy. Heavy ribbed ramp platform has full 10-ton roll-over capacity in any direction. *Loomis Machine Co.*

155—Air-Powered Vacuum Cleaner operates off any compressed air source, presents no problem of electrical outlets, and is safe in wet or explosive atmospheres. Creates powerful suction (up to 4 in. of vacuum) to pick up embedded dust and dirt. *Laukhuff-Pratt Mfg. Co.*

156—Marine Steam Generator, compact dry-land 150-hp. model, delivers 5000 lb. of steam per hr. Unit is only 7 ft. high, occupies 8x7-ft. floor space. Other units range from 18-750 hp., operate at pressures to 200 psi. *Cyclotherm Div., National-U.S. Radiator Corp.*

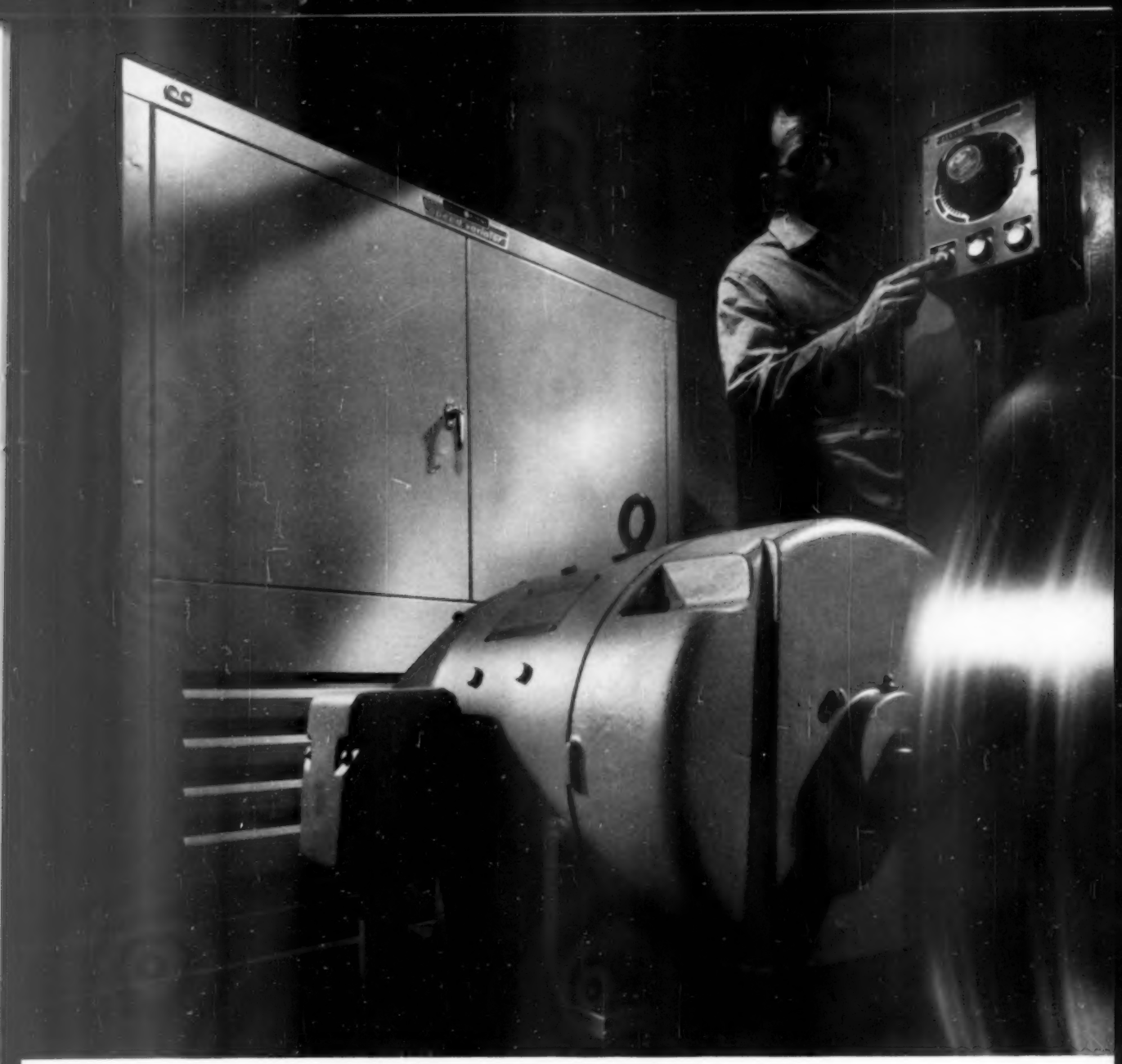
157—Induction Paint Baking apparatus—a conveyorized 30-kw. high frequency induction heating unit—bakes continuously fed sheet metal strip and other parts in just a few seconds. Solvent fumes are exhausted during the heating cycle. *Scientific Electric, Inc.*

158—Low-Cost Sand Blaster quickly removes rust, paint, dirt, and weld scale—right down to bare metal—from moldings, seams, corners, engine parts, and hard-to-reach "blind spots." The tank holds 12 qt. of abrasives. Price, with extra blast nozzle, about $30. *A.L.C. Co.*

159—Roto-Scraper Tool makes fast work of surface preparation or clean-up on wood, brick, metal, or masonry surfaces. Unit consists of 4 cutting blade units, each with 24 steel blades, housed with a safety guard. Weighs 3¾ lb., including motor. *Roto-Scraper Co.*

160—Eccentricator is an electric indicator that shows eccentricity directly without computation. It indicates eccentricity, runout, lack of squareness, or wobble in workpiece condition, while ignoring normal piece-to-piece variation in size. *Federal Products Corp.*

Turn to page 124



5 REASONS WHY YOU SHOULD BUY—

New General Electric Speed Variator

1. **Amplistat Regulator** offers better speed regulation and adjustable, timed acceleration for improved product quality.

2. **Static Exciter,** with silicon rectifier, has no moving parts, requires no warm-up, provides more production time, less maintenance.

3. **Two-Unit, Four-Bearing M-G Set** features Tri-Clad† '55' motor for more dependable performance.

4. **Front-Connected Controls,** recessed wiring troughs make routine inspection easy, cut maintenance time.

5. **Kinamatic* Drive-Motors** provide instant response to control signals. For details on this fast-acting motor see next page.

For more information contact your Apparatus Sales Office or write for GEA-6643. *Direct Current Motor & Generator Department, Erie, Pennsylvania.*

In Canada, contact Canadian General Electric, Peterborough, Ontario.

† *Registered Trade Mark General Electric Co.*
* *Trade-Mark of General Electric Co.* 813-9

GENERAL ELECTRIC

More On Kinamatic Motors

NEW GENERAL ELECTRIC DC MOTOR GIVES

Instant Working Power

KINAMATIC* . . . a new standard in industrial direct current motors . . . designed to deliver drive power at the moment you need it!

Split-Second Response . . . larger air gaps reduce electrical time constants . . . smaller armature diameter permits more rapid delivery of torque to load . . . means faster starts, stops, reversals.

Low Inertia Armature is dynamically balanced, banded with steel and glass . . . gives dependable, high-speed operation . . . skewed armature slots minimize torque pulsation, permit smooth machine operation at low speed.

Other Power Packed Features of new d-c Kinamatic motors help give you more continuous, more automatic production . . . economically.

Additional information is available at your nearest General Electric Apparatus Sales Office. Or, if you prefer, write for Bulletin GEA-6355. *Direct Current Motor and Generator Department, Erie, Pennsylvania.* 813-9

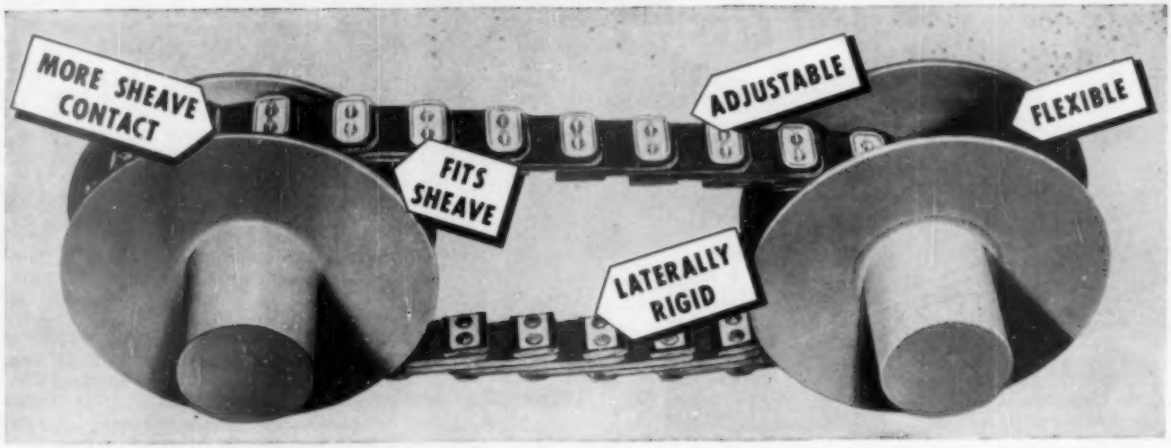
*Trade-Mark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW! MANHEIM VARIABLE SPEED BELT

Replaces Enclosed Drive Belts Without Disassembly!



MVS Belt on a rotary annealing furnace drive gives dependable service even under extreme oil, dust and 200° F. operating conditions.

INSTALLS IN MINUTES INSTEAD OF HOURS— NO MACHINE DISASSEMBLY

A typical installation of a 2″ MVS Belt operating an industrial production machine.

MVS BELT makes wood block and variable speed v-belts completely out-of-date

MVS Belt sets a new standard in V-to-V drives because it is adjustable to any length and is installed in minutes instead of hours.

Its patented design eliminates drive disassembly. MVS Belt is placed around the sheaves and coupled with T-screws and cup-washers, reducing down-time to a matter of minutes. Inventory costs are cut by eliminating the need to stock standard lengths. You can make as many as 25 sizes of variable speed belt from a single package of MVS Belt in a given top width. Each package contains 100 links, approximately 13 ft. Available in 26 widths from 1½″ thru 5″.

FREE LITERATURE SHOWS HOW MVS BELT DOES A BETTER JOB

Uniform thickness and width guarantee constant power delivery at all speeds with no cross-sectional distortion. MVS uniform links assure a perfectly balanced drive that reduces vibration and improves production quality. Priced to offer you big savings. *Write today for complete details on the new MVS Belt.*

★ **ADJUSTABLE TO ANY LENGTH**
★ **GUARANTEES CONSTANT POWER DELIVERY**
★ **REDUCES VIBRATION UP TO 90%**

MVS

MANHEIM
MANUFACTURING & BELTING CO.
Manheim 2, Pennsylvania

©M. M. & B. Co. 1958

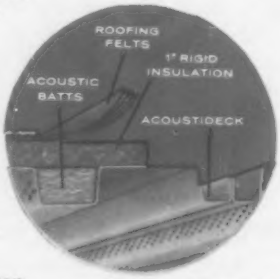
NEW DUAL-PURPOSE MILCOR ACOUSTIDECK

Now you can get the advantages of *steel roof deck* with *outstanding acoustical values*, at cost savings up to 50%! You enjoy speed of erection. You save on structural supports. Acoustideck weighs less than half of equivalent poured-in-place or precast construction — carries normal loads over greater spans.

A sound-absorption test conducted by Armour Research Foundation showed Milcor Acoustideck to have a noise reduction coefficient of .70. It satisfies requirements of classrooms, industrial plants, offices, gymnasiums, tank rooms, etc.

The underside of Milcor Acoustideck is left exposed as a ceiling. The fluted design — with the Bonderized, baked-enamel primer — has a clean, modern appearance.

There's more you should know about Milcor Acoustideck. Write today for Catalog 241.



Thermal insulation can be applied with non-piercing clips or cold adhesives. A vapor barrier can be furnished where required.

MILCOR®

INLAND STEEL PRODUCTS COMPANY

Dept. K, 4119 W. BURNHAM STREET • MILWAUKEE 1, WIS. ATLANTA, BALTIMORE, BUFFALO, CHICAGO, CINCINNATI, CLEVELAND, DALLAS, DENVER, DETROIT, KANSAS CITY, LOS ANGELES, MILWAUKEE, MINNEAPOLIS, NEW ORLEANS, NEW YORK, ST. LOUIS. RD-18

FACTORY / EQUIPMENT NEWS

Begins on page 108

For more about these items, circle item numbers on Reader Service Card next to back cover.

161—Flexible Connector for freon lines dampens vibration and pulsation from air-conditioning equipment—withstands temperatures to 400 F., working pressures to 150 psi. Seamless bronze tubing has braided covering; comes in 10 sizes. One-year warranty. *Korfund Co., Inc.*

162—Air Cleaner, offered in pipe sizes ¼ to 1 in. for operation up to 250 psi., is designed to remove all traces of contamination (down to 5 micron size) from compressed air systems. Device is useful for instrument panels, paint spraying, and so on. *Wilkerson Corp.*

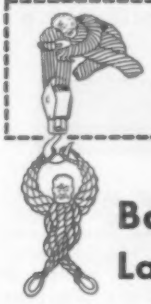
163—Electric Lift Trucks in K410 line are compact, maneuverable handlers with up to 20,000-lb. capacity. Gas trucks (gasoline or LP-gas operated) in new G-5 line are also compact, rugged, maneuverable vehicles having up to 20,000-lb. capacity. *Yale & Towne Mfg. Co.*

164—"Electri-Cand" Pump for leakless handling of critical liquids up to 200 F. has no mechanical seals or packing. Single-stage, single-suction pump has carbon sleeve bearings, "canned" rotor and stator. Ratings to 500 gpm., 250-ft. head. *Allis-Chalmers Mfg. Co.*

165—Colored Drop-In Panels of yellow, pink, blue, or green translucent plastic provide pastel ceilings and allow a quick change in decor. Individual panels are quickly mounted or removed. Open egg crate construction avoids dirt accumulation. *Silvray Lighting, Inc.*

166—Portable "Thermoweld" is a quick-heating, soldering, and brazing device that offers many safety features to aid maintenance men. Equipment consists of cabinet, 3-wire a-c line cord, foot-switch, work ground clamp, and high current work probe. *Auto-Test, Inc.*

Turn the page



Tuffy. Tips On

SAFE USE OF SLINGS AND HOIST LINES

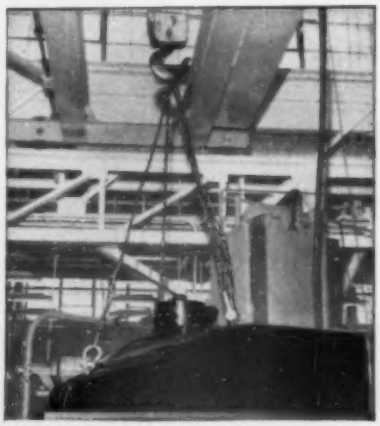
Back Injuries and Strains Loom Large in Industrial Accident Picture

Records for recent years in Illinois, as reported by the State Department of Labor, show an average of 8.9% of all compensation cases closed are for back injuries; another 7.4% for strains and overexertion in lifting or lowering. A total of about one in every six claims are for these two categories of injury.

How can we reduce materials handling accidents? The first answer, of course, is not to use human muscle for the heavy lifting jobs that should be done by the proper size hoist, hoist line and slings.

Here are some other answers:

1. **Keep pull** on sling legs in a straight line. Never shorten legs with knots or I-bolts. If choker and basket hitches are used as slings, safe load limits should be rigidly checked.
2. **Load slings** on the center of hooks; never at their points, except for hooks specially designed for point-loading.
3. **Never use** load hooks that are bent open. They have been overloaded, and may drop loads with disastrous results. Same goes for defective chain blocks. Insist that your men report them at once.
4. **Lubricate wire** ropes at regular recommended intervals, with lubricant recommended by your local oil company engineer.
5. **Break in** new wire rope with care. Don't use it as maximum load capacity until it is broken in.



Bad Use of a Good Sling

Here you see a Tuffy Sling in a poor, off balance hook-up. A Tuffy Type U-9, 3 leg bridle Sling would save time and work far more safely than this improvised hitch with unfitted slings and clevises.

Right and Wrong Ways to Uncoil Wire Rope

RIGHT:

Wire rope in short lengths is furnished in coils. Roll the coil slowly like a wheel and have a nice straight rope before you can say "tuffy."

WRONG:

Uncoiling by laying the coil flat and pulling off the top gives you hard-to-handle, kinky rope. Frustrating and time-killing!

FREE! Tuffy Sling Handbook

Gives complete data on Tuffy Slings — types, dimensions, weights and rate loads. Plus a complete rigger's manual and engineers notebook on wire rope constructions and specifications. Write for your copy now.

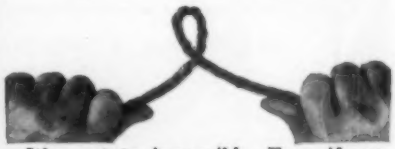
Get Safety First With The First Name In Slings...

Tuffy.

Exclusive Tuffy Fabric

The secret of the extra strength and greater flexibility of Tuffy Slings is also the secret of their greater safety. It's the exclusive, patented, machine-braided fabric. You won't find it in any other machine-made sling. It means longer sling life, easier handling and greater capacity for taking deadloads, shocks and impact with safety.

Try to Kink a Tuffy Sling



It's next to impossible. Even if you do succeed in kinking it with the help of a vise, you can straighten out the sling with no material damage to the fabric. Tuffy's resistance to knotting, kinking and looping is extra protection against hazardous weakening of the sling.

Tuffy's Pressed-On Ferrule

Here's another Tuffy feature that adds safety to longer sling life. Applied under tremendous pressure, the steel ferrule literally flows into spaces between wires and strands—giving the eye-splice *full strength of the fabric.* And the streamlined ferrule eliminates snags and projections that might injure hands.

Your Tuffy Distributor is Stocked to Meet Your Needs—Fast!

He's ready with all your Tuffy Slings and Union Wire Rope needs. And ready to help you with any sling or wire rope problem. Get in touch with him now!

union Wire Rope corporation

SUBSIDIARY ARMCO STEEL CORPORATION

Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand.

2234 Manchester Ave. **Kansas City 26, Missouri**

For more facts circle 521 on Reader Service Card

TRADE ARRO MARK

MACHINE SCREW ANCHORS

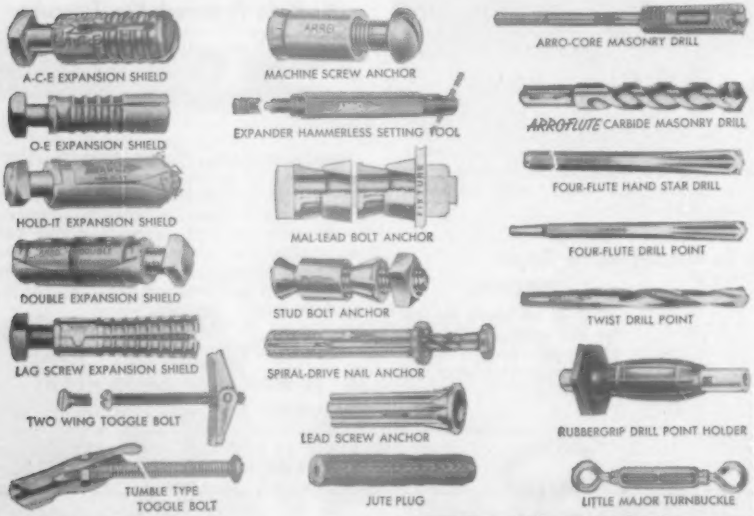
Easy to install . . . requires shallow hole . . . fixture can be removed and replaced without loosening anchor . . . a few hammer blows set anchor firmly . . . conical-shape nut expands lead sleeve to provide strong holding power . . . widely used by electricians, plumbers, carpenters, ornamental iron workers, maintenance men, awning and sign men and other tradesmen.

Cutaway drawings show how setting tool expands lead sleeve around conical nut.

HAMMERLESS SETTING TOOL

Expander hammerless setting tool for easy installation of Arro Machine Screw Anchors in hollow tile, bottomless or weak-bottom holes.

THE TRADE ARRO MARK LINE OF MASONRY ANCHORING AND DRILLING DEVICES



See your industrial, hardware or electrical supplier

TRADE ARRO MARK

ARRO EXPANSION BOLT COMPANY

DEPARTMENT E, P.O. BOX 388, MARION, OHIO

FACTORY / EQUIPMENT NEWS

Begins on page 108

For more about these items, circle item numbers on Reader Service Card next to back cover.

167—Airless Paint Spray System based on hydraulic atomization is a portable, moderate-priced outfit that permits work in open areas without a spray booth. Compact, mobile unit carries the original paint container; practically eliminates overspray. *Spee-Flo Co.*

168—Walkie-Rider Tractors are 6 models with 12, 24, or dual 12/24 v. electrical systems. To operate as "walkie," operator lowers control handle, walks along. To ride he returns handle to full vertical position, rotates control grip. *Lewis-Shepard Products, Inc.*

169—Pneumatic Temperature Controls, recording and indicating models, maintain pre-set temperature by controlling flow of heating medium. Control actuates a 15-psi, air-operated steam valve or other device; comes in 10 ranges between −30 and 1100 F. *The Partlow Corp.*

170—Stepless A-C Controls for crane and hoist applications employ static magnetic components that greatly reduce the amount of maintenance needed. New "7400" line includes both static-reversing and contactor-reversing reactor controls. *General Electric Co.*

171—Power Sweeper boasts clean-cut design plus built-in brawn for heavy duty. Stabilized pressure on floating main broom and side broom assures even sweeping action on a swath up to 70 in. Unit features power steering, turning radius of 5½ ft. *Patch & Kase Corp.*

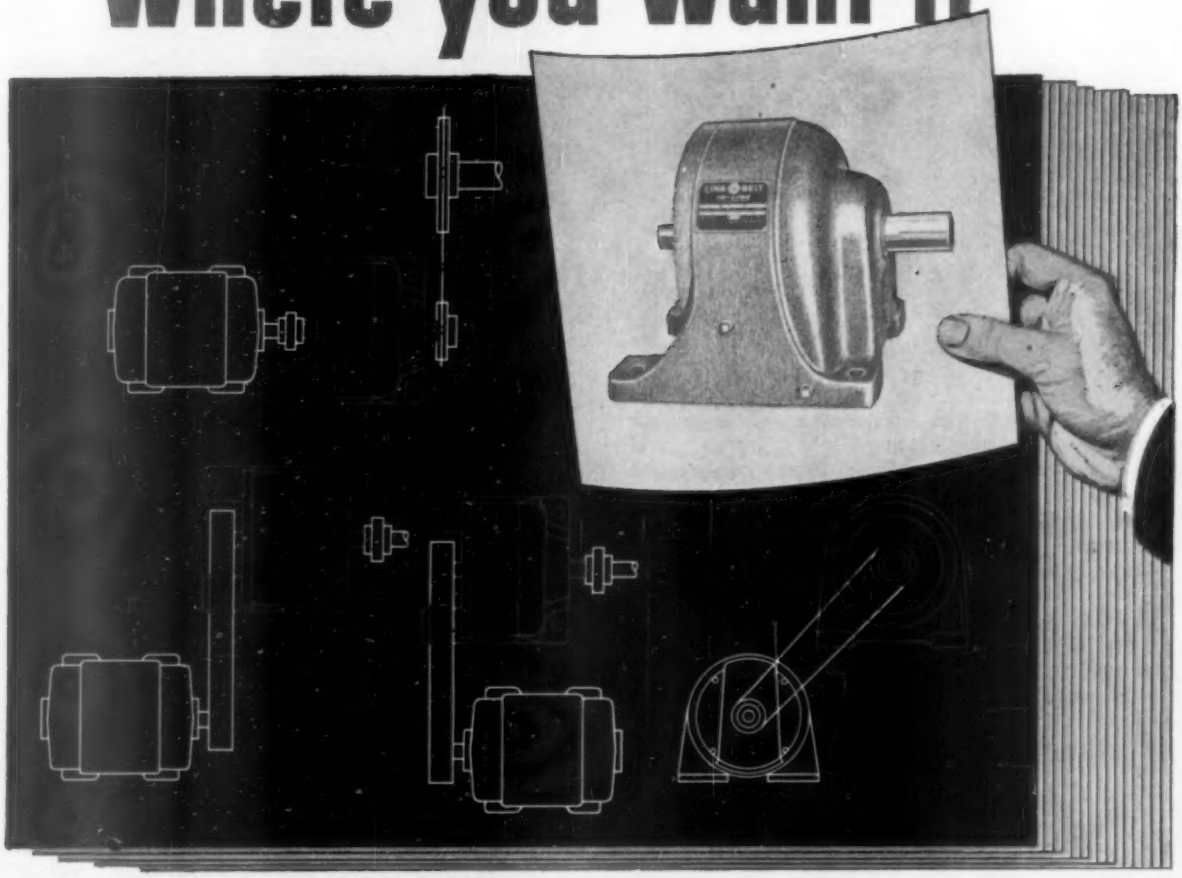
172—"Reserve Power" Time Switch continues to operate on time for up to 17 hours after a power failure. Device never needs hand winding; spring is electrically wound—automatically. Rewinding after prolonged outages is completed in 2 hr. *Tork Time Controls, Inc.*

173—Propane Diluter supplies "stand-by" fuel (accurate mixtures of propane and air or butane and air) during gas curtailment in small or large installations. Units connect to existing gas piping, eliminate dual piping, separate air blowers, mixers, etc. *Selas Corp.*

Turn to page 133

Here's a SPEED REDUCER that lets you

mount the motor where you want it



Versatile **LINK-BELT** *In-Line helical gear drives give wide latitude in drive arrangement*

Make the most of mounting space with quiet, cool-running, oil-tight Link-Belt In-Line helical gear drives. No need to direct-connect the motor. Where layout requirements so dictate—or to achieve even higher reduction at low cost—a chain or gear drive can be used in between. Location of input and output shafts on same planes make installation easy, saves space.

Consists of a streamlined housing with double, triple or quadruple reductions up to 206 hp. Call your authorized Link-Belt stock-carrying distributor or nearby Link-Belt office. Ask for Book 2651.

BOOK 2651

LINK-BELT

SPEED REDUCERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,505

For more facts circle 523 on Reader Service Card

By GEORGE A. HOY, JR., Industrial Management Editor, FACTORY

Pulling for Better Government

Here's a company with a conscience and the courage to enter the no-man's-land of politics. Rather than just theorize about the value of citizen participation in political campaign funds, Aerojet-General Corporation (Azusa, Calif.) promotes a competitive, company-sponsored program. Republicans, Democrats—anyone with an interest in clean government—are encouraged to contribute to the campaign fund of the politician or party of their choice.

During off-duty hours voluntary good-government committees work for employee contributions. The two committees, Republican and Democratic, are headed by top company officials. Besides stimulating employee interest in government, the program seeks to reduce the need for "special interest" money in political campaigns. Company President D. A. Kimball believes higher-caliber candidates will enter politics if heavy campaign costs are borne by citizens.

Politicians give their hearty approval. And the Defense Department, with whom Aerojet-General does business, gives its blessing, too.

Gripes Speed Contract Talks

Are months-long contract negotiation battles normal for your company and union? If so, you'll find hope in this story. Comes from American Management Association's (New York) Executive Action Course.

For an even dozen years employees of one large printing firm had hit the bricks before a new contract could be worked out. Reason was that the company and the international representatives of the union never could complete their battle in the 60 days allowed for bargaining. In fact, negotiations often took five to eight months.

Then last year the company set up gripe sessions with the shop stewards—first individually, then as a group. The idea was to stimulate agreement at the local level by encouraging stewards and the local agent to voice problems as they arose. The local agent liked the meeting idea, suggested meetings be used to resolve all conflicts before annual contract negotiations got underway.

Result: You guessed it. Latest negotiations took only two weeks, ended in happy agreement.

Prosperous Poor Man

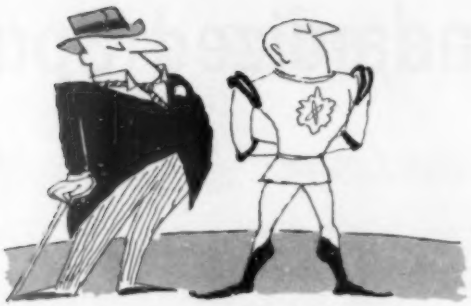
Collar the next 10 people you meet on the street or in the plant, suggests the Chamber of Commerce of the United States. Ask 'em if their incomes have kept pace with the cost of living. Like the man in the cartoon above, a majority of the people you ask will stand amid their luxuries, stretch their pockets, and bemoan their loss of real income.

The facts are otherwise, says the Chamber's monthly pamphlet, "Economic Intelligence." The official government figures show that from 1939 to the present the consumer price index rose by about 108%, while average hourly earnings in manufacturing increased by about 235%. And this earnings increase doesn't include all of the fringes.

Here's more: Since the 1954 recession, earnings in manufacturing have risen 17.8% while the consumer price index has risen only 7.4%. And what's true for manufacturing is true for most other groups. Construction, retailing, service, and other wage groups have increased earnings faster than prices have increased.

What accounts for the poor-mouth? Human nature is the best explanation. Regardless of income, most people are able to spend money faster than they make it. But the spender is not willing to face up to his poor money management. So he scapegoats, blames the cost of living.

This story is as old as history. And there is no known solution. But it helps to have the facts straight when workers, union, and even supervisors, cry the economic blues.



Fuddy-Duddy or Futuristic?

Look around you. Do you see a picture of conservatism or of progressiveness? What you see is important to you in terms of your own job performance —and in terms of your own future.

Progressive companies are willing to change their products, and they count on increased sales to finance growth. Conservative firms, on the other hand, expand only in response to increased demand for their goods. The conclusions above are those of S. W. Steinkamp of the University of Michigan. They are based on a study of 237 large business firms.

Steinkamp measured each firm's degree of progressiveness based on 10 factors. They are:

- Was your company early with a pension plan?
- Does it change its primary banking connections from time to time?
- Will the company borrow from banks?
- Has it a large number of banking connections?
- Will it borrow from insurance companies? Will it issue securities?
- Does the company have a policy of using funds from the outside?
- Has it introduced new products consistently?
- Does the company prepare budgets?
- Does it use scientific methods in forecasting?
- Does it use outside consultants and information from the outside?

Why not apply the checklist to your own company? If the score for progressiveness is low, you might want to consider some mental jostling of the rest of the company's management whenever possible. Every push in the right direction helps.

Bottle-Beaters

More proof of benefits of a program for alcoholic workers comes from Allis-Chalmers Manufacturing Company, Portland, Ore. Discharges due to drinking are down from 184 in 1945 to only 15 last year. A-C people feel the difference is credited to a program for alcoholics started in 1946.

A-C studies showed that alcoholics are often people who have been on the payroll for several years and who are drawing above-average pay. And the studies prove that rehabilitation costs are less than replacement costs in the long run.

Could be some of your half-men (due to drink) are potentially some of your best men. And it might pay to give them help to beat the bottle.

At Plant and Home, Contestants Spur Safety

Quiz Show in the Plant . . .

There are cash prizes for right answers in the category, "Safety on Your Job." Only things missing—at Lehigh Structural Steel Company (Allentown, Pa.)—are an isolation booth and a slick announcer.

Employees who know the right answer to questions about their job safety win $5. One catch: During the four weeks of the program, contestants must carry their safety booklet. The booklet is issued each new employee, is added to each time he transfers to a new job with different safety requirements. Contestants are disqualified if they don't have their booklet when the quizmaster approaches them.

If safety, as the experts say, is a state of mind, this is one sure way to get the message firmly etched on employee brain cells.

. . . and a Phone Contest at Home

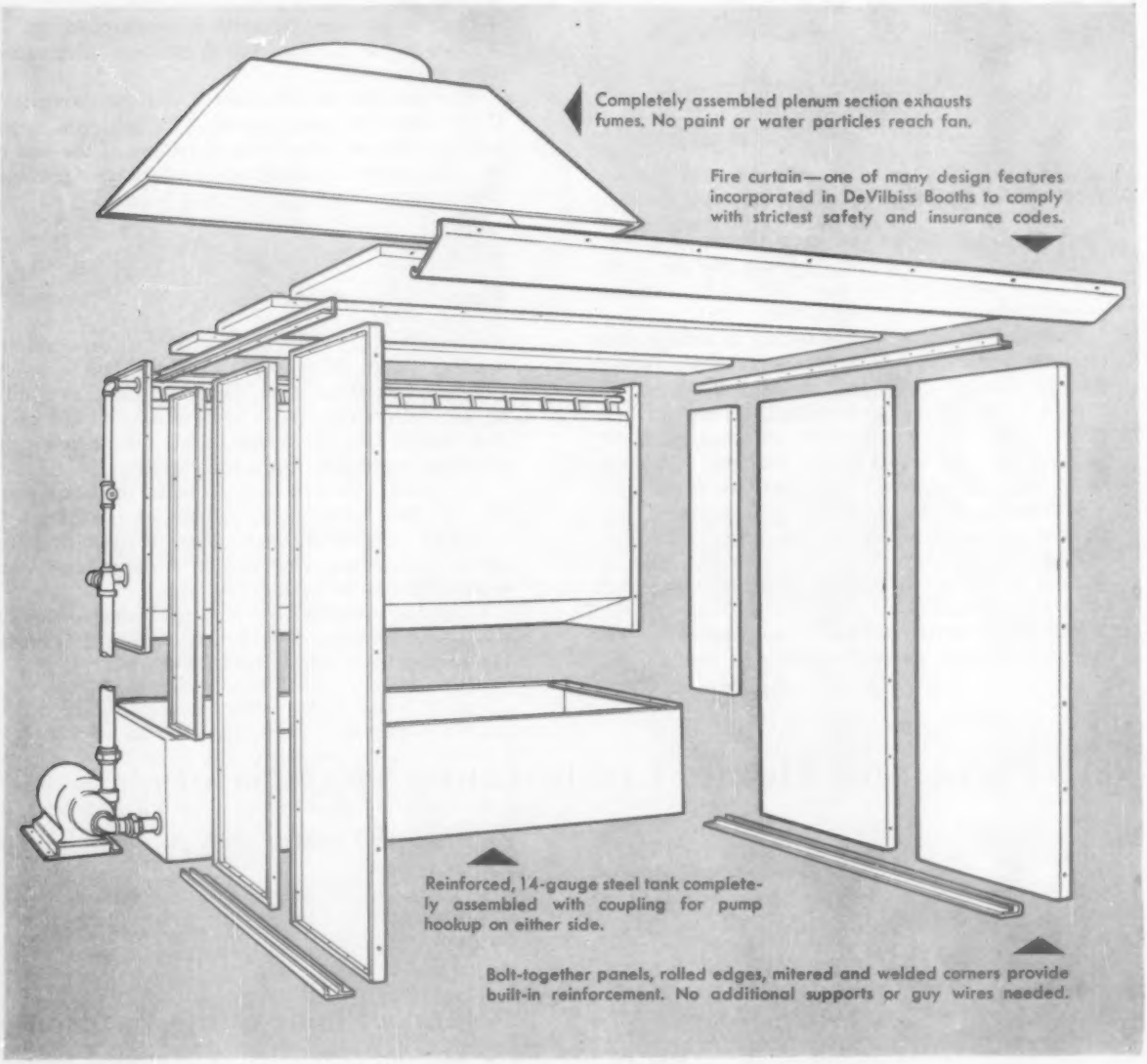
Get the family involved, says the professional salesman. It's a sure way to focus the breadwinner's attention on the product. In this case the product is safety, and Reynolds Metals Company's North Plant (Richmond, Va.) got the family involved in two ways:

1. The plant record of man-hours worked without a disabling accident was posted each day at the plant entrance. And a fresh safety slogan was posted alongside the record. Random-selected employees' homes were called, and whoever answered (except employees, who were not eligible) was asked to give the slogan or number of safe man-hours worked.

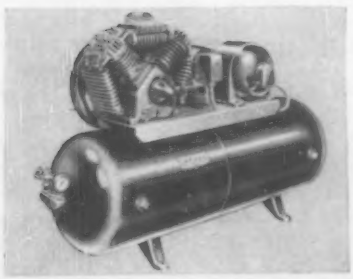
2. Correct answers won the family a free dinner and tickets to a movie or ball game, family choice.

It's a grand old principle. Best way to remember information is to teach it to the whole family.

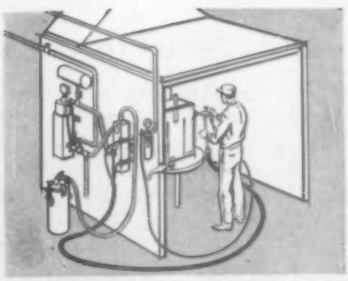
How DeVilbiss Standardized Spray


Completely assembled plenum section exhausts fumes. No paint or water particles reach fan.
Fire curtain—one of many design features incorporated in DeVilbiss Booths to comply with strictest safety and insurance codes.
Reinforced, 14-gauge steel tank completely assembled with coupling for pump hookup on either side.
Bolt-together panels, rolled edges, mitered and welded corners provide built-in reinforcement. No additional supports or guy wires needed.

DeVilbiss Automatic Spray Machines coat products of any size or shape quickly, economically, automatically.
Send for Series I-8000 Bulletins

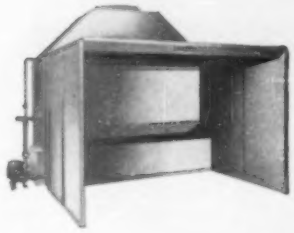


DeVilbiss Air Compressors deliver as much as 22.6% more air per power dollar. Sizes range from ½ to 25 hp.
Send for Catalog C-50



DeVilbiss Hot Spray. Provides heavier film build, with faster drying, less overspray, and fewer rejects.
Send for Bulletins IE-114B and F-286

Booths save assembly costs



Prefabricated parts bolt together to form a rigid, self-supporting structure. It's quick, easy! Wide selection of sizes and types

More value for your spray-booth dollar. DeVilbiss "ready-made" booths can be assembled quickly and economically by simply bolting standardized parts together; are easily modified to meet future needs. Mass-produced panels, accurately sized and punched, are self-reinforcing . . . form a rigid, free-standing structure. Snug fit provides a smooth, easy-to-clean interior surface.

DeVilbiss Spray Booths have outstanding design and construction features that are responsible for their high paint-trapping efficiency, their ease of installation. And you save on operating costs, too. Perfected design principles reduce power consumption of fans and pumps. Booths stay cleaner longer; require less maintenance time and expense.

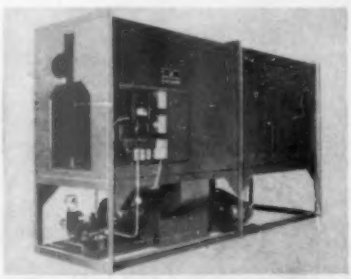
They are manufactured to the standards of the National Board of Fire Underwriters for spray booths as recommended by the National Fire Protection Association.

Selection and delivery are no problem, either. In most cases, one of over 500 standard sizes and combinations will fit your needs. But should you require equipment for a special installation, or help in selecting and pricing components, a DeVilbiss representative will be glad to work with your engineers at no cost or obligation.

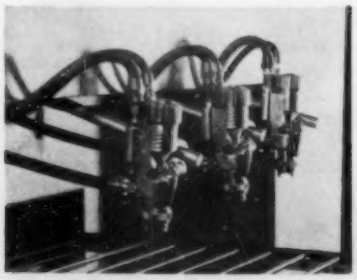
PLUS VALUE: At DeVilbiss, you deal with the *only* one-source designer and manufacturer of completely engineered finishing systems or individual components. Call your nearest branch office, today. Or write for a copy of the Spray Booth Catalog I-7000 containing handy selector guide.

DEVILBISS

THE DEVILBISS COMPANY, Toledo 1, Ohio • Detroit, Michigan • Barrie, Ontario • London, England • Branch Offices in Principal Cities



Continuous process ovens. Designed and manufactured to meet layout and production needs for baking or drying. *Send for Oven Catalog*



DeVilbiss Automatic Guns spray all coatings accurately, uniformly; insure better finishes at lower cost. *Send for Catalog I-1125A*

DeVilbiss Fluid Hose. Unsurpassed for resistance to solvents, oils. Flexible, kinkproof. Full line of connections. *Send for Catalog IE-E.*

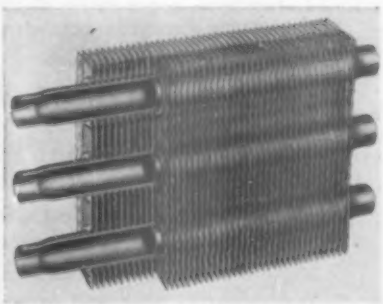
For more facts circle 524 on Reader Service Card

HIDEAWAY SEASONMAKER

McQUAY Means Quality

When you think of quality, you automatically think of McQUAY, because McQUAY MEANS QUALITY.

SEASONMASTER AIR CONDITIONER



RIPPLE FIN COIL CONSTRUCTION

Only McQuay units are equipped with the famous and exclusive Ripple Fin coils which create the maximum air turbulence necessary for efficient heat transfer. Expanding the copper tube against the wide, full fin collars, which act as automatic spacers, provides rigid metal-to-metal contact and completely covers the copper coil to form a "tube within a tube".

The complete McQuay product line is constructed of the finest heavy gauge materials—combined with the NEW McQuay Galva-Seal process, bonderized and then finished with a special formula enamel baked on—offering you the finest corrosive resistant assembly available. And, the Dura-Frame "V" channel construction, another McQuay exclusive, provides the strength and rigidity necessary to quiet, trouble-free operation.

There is no substitute for quality, no substitute for the experience and the research and engineering for which McQuay is famous.

Compare McQuay in every way—from the appearance and beauty of the finished product to the heart of each unit, the coil itself—and you will readily see why McQUAY MEANS QUALITY—and quality means performance and long life. McQuay, Inc., 1620 Broadway Street N.E., Minneapolis 13, Minnesota.

INDIVIDUAL ROOM SEASONMAKER

DURA-FRAME "V" CHANNEL CONSTRUCTION

MULTI-ZONE AIR CONDITIONING UNIT

McQuay Means Quality

FACTORY / EQUIPMENT NEWS

Begins on page 108

For more about these items, circle item numbers on Reader Service Card next to back cover.

174—Kit of Tools for adjusting relays contains 18 tools designed to do any job of trouble-shooting for all types of relays. Included are various wrenches and screwdrivers, flat nose pliers, a magnifying inspection mirror, and thickness gages. *P. K. Neuses, Inc.*

175—Compact Silicon Rectifiers meet special needs of shop power supply, electrochemical processing, other d-c applications. Balancing reactors assure proper internal current distribution. Voltages to 600 v., wide range of kw. ratings. *Hanson-Van Winkle-Munning Co.*

176—Acousti-Room "250" makes ideal enclosure for industrial hearing tests—and entire room can be moved by fork truck! It's built of 2½-in.-thick panels, with "Noise-Lock" door, window, and ventilation silencer; intercom system is optional. *Maico Electronics, Inc.*

177—Rotary Air Compressors, electric-power, offer 130- to 625-cfm. free air delivery at 100 psi. These 2-stage, sliding vane units are oil-cooled, lubricated, sealed; also vibration-free. Can be installed without expensive concrete foundations. *Jaeger Machine Co.*

178—Finger-Flexible Teflon Hose offers long, corrosion-free service in wide temperature range from −65 to +400 F. New convoluted hose, in ¾- to 2-in.-dia. sizes, has a minimum bend radius about 3½ times the hose dia. Lengths to 25 ft. *Titeflex, Inc.*

179—"Gage Gard Jr." protects sensitive pressure instruments such as incline manometers, draft gages, low-pressure transducers. New 11-oz. device (measuring 3¼x1½x1¾ in.) comes in four ranges, covering span of −15 to +85 psig. *Industrial Engineering Corp.*

Turn the page

WHY PAY MACHINISTS TOP WAGES TO WAIT AT A TOOL CRIB?

Stop costly waiting... use new McCaskey Tool Control System!

NOW! Completely eliminate time lost by highly-paid machine operators drawing and returning tools. New procedures in McCaskey's famous Tool Crib System allow crib attendants to prepare kits of tools for jobs in advance. Machine operators simply pick them up, or they may be delivered.

No Time Wasted At Tool Crib. More Working Time At Machines

Hundreds of plants report that the McCaskey System also reduces tool purchases by cutting crib inventories; reduces loss and theft; cuts costs so many ways it pays for itself in 90 days. *Send for complete details today!*

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Position .....

Company .....

Address .....

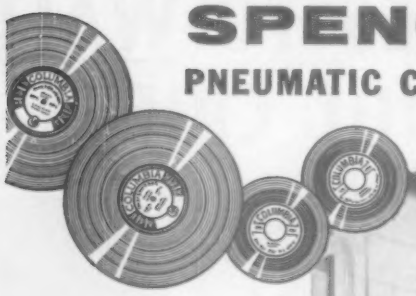
City ..... Zone ..... State .....

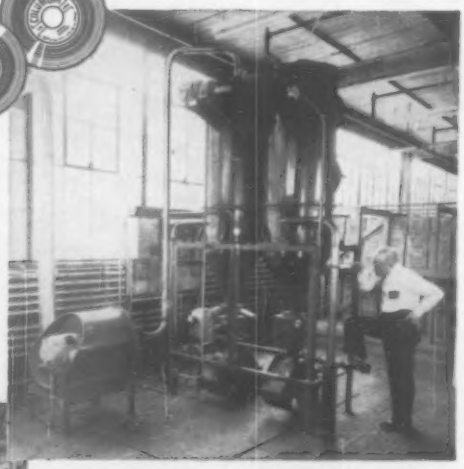
Sweet 1 production Music at Columbia Records Plant...

Thanks to a

SPENCER

PNEUMATIC CONVEYING SYSTEM





Vacuum producer pulls pellets into separators (at right).

Production line of record presses fed by Spencer system.

From plastic pellets to completed discs, there is no manual handling of materials here at the Columbia Records plant, Bridgeport, Conn.

Pellets are picked up at the pelletizer, conveyed to a large hopper. From there, material is blown through a piped circuit to small "feed" hoppers on each automatic record pressing machine.

Advantages of the Spencer system are many and measurable:

Savings on Material Handling Costs—Manual and mechanical hopper-loading is eliminated, man-power freed for productive tasks.

Increased Production—No "down time" on record presses due to lack of material.

No Contamination of Material—Dirt, metal chips, glass, etc. cannot enter the piped system.

For recommendations (and suggested piping lay-out) on a SPENCER system to solve your needs, write outlining your requirements.

Request Bulletin No. 143-B

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

ALSO MANUFACTURERS OF: STATIONARY VACUUM SYSTEMS · PORTABLE VACUUM CLEANERS · BLOWERS

FACTORY / EQUIPMENT NEWS

Begins on page 108

For more about these items, circle item numbers on Reader Service Card next to back cover.

180—Small Hydraulic Filter fits in restricted spaces to filter all types of hydraulic fluids, lubricants, fire-resistant liquids, and coolants. Wire mesh filtering element is easily removed from aluminum alloy housing for cleaning. *Capital Engineering & Mfg. Corp.*

181—Three-Way Solenoid Valve and three-way pilot valve both use same type base and consist of same operating parts. The valves feature fast interchangeability and require minimum spare parts. Five thread sizes range from ¼- to 1-in. on both. *A. Schrader's Son.*

182—Magnetic Particle Testing Kit is used in field or plant during overhaul inspection to detect cracks in critical parts in machines and equipment. Metal case contains magnetizing coil and yoke, powder and two dispensers, two 25-ft. power cords. *Magnaflux Corp.*

183—Sectional Aluminum Ladder, made up of 5 interchangeable 8-ft. sections, can be formed into many combinations of individual 8-, 16-, 24-, or 32-ft. ladders; or can serve as a full 40-ft. ladder. Each section weighs only 12 lb. *Scranton Aluminum Mfg. Co.*

184—"Automated" Forging Press, 2500-ton capacity, is designed for high-volume forging of parts such as connecting rods, ring gears, etc. Hot bars move left to right through 2-station forging, then into chute at right. Trim station may be added. *Erie Foundry Co.*

185—"Weldanpower" Machine serves as 5-kva. power supply for use in event of commercial power failure, or where commercial power isn't available. In addition, "Weldanpower" is a 200-amp. welder. It delivers 13.1 hp. at 2000 rpm. *The Lincoln Electric Co.*

186—Flexible Teflon-Lined Hose is available in sizes to 3-in.-dia. to stand temperatures up to 325 F. Teflon tube offers a glass-smooth surface: paints and varnishes won't stick to it and it can be sterilized to handle food products. *Raybestos-Manhattan, Inc.*

Turn the page

For more facts circle 527 on Reader Service Card

For more facts circle 528 on Reader Service Card ➤

NEW Allis-Chalmers 2,000-lb Lift Truck

...a Standout Performer!

LET'S LOOK AT THE FACTS...

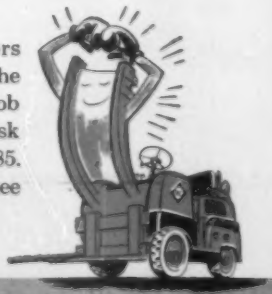
Greater Lugability— from a rugged heavy-duty industrial engine with full 35 hp, 97 ft-lb of torque.

Climbs a 40-percent ramp loaded. Power, traction, plus low center of gravity, add up to gradability that can't be matched.

Greater accessibility— ready for servicing in 22 seconds . . . and can be stripped down to the chassis in 22 minutes. Serviceability like this means many extra hours on the job.

Proven "Years-Ahead" design—means *more* dependable, continuous . . . economical hours on the job.

Ask your Allis-Chalmers dealer to demonstrate the NEW FT20-24 on *your* job under *your* conditions. Ask for the new Bulletin BU-485. Allis-Chalmers, Milwaukee 1, Wisconsin.



BH-82

ALLIS-CHALMERS

"Hefty" the FT 2,000-lb champ Saves you more, Makes you more.

GARDNER DENVER

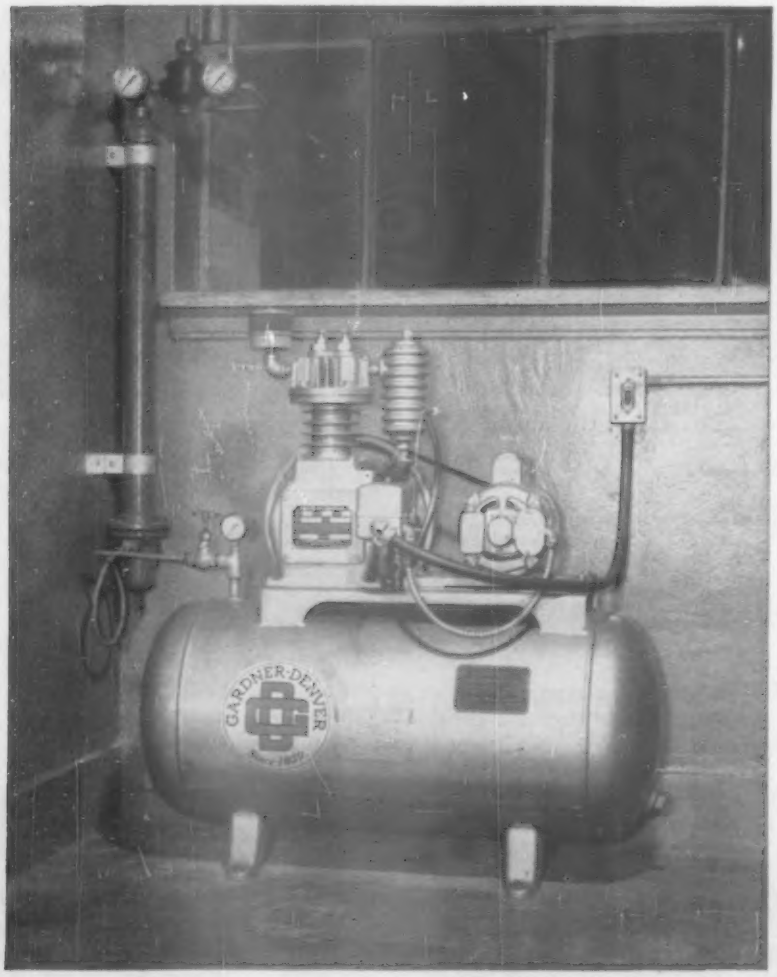
Hook up a small and compact Gardner-Denver CACB compressor and be sure of the pure, oil-free air you need for instrumentation, processing or the manufacture of chemicals.

The CACB uses no oil in the cylinder. Pistons and piston rings are made of self-lubricating carbon—no oil or water lubrication required. This highly efficient compressor supplies four to five cu. ft. of low-cost oil-free air per min., with discharge pressures from 40 to 100 psi. Write for complete information.

Stationary air compressors . . . tank-mounted compressor outfits . . . oil-free air compressors—whatever your compressed air needs, see your Gardner-Denver compressor specialist first. Gardner-Denver Company, Quincy, Illinois.

Low-cost . . . oil-free air

Compact CACB compressor



FACTORY/EQUIPMENT NEWS

Begins on page 108

For more about these items, circle item numbers on Reader Service Card next to back cover.

187—Numerical Control Tape preparation system punches tape for automatic machining of parts with 2- and 3-dimensional contours or free-form curves (intricate cams, dies, etc.). Makers say engineer can learn to use "Compac" system within a week. *Bendix Aviation Corp.*

188—Rotary-Screw Air Compressors offer high delivery rates, deliver completely oil-free air, and require little maintenance since rotors don't come in contact during operation. "Twin-Air" compressors are offered in 6700-, 10,000-, and 19,250-cfm. models. *Atlas Copco.*

189—Percussive Welder for end-welding studs to light-gage metals operates on stored energy principle—discharges current and end-welds fastener in 0.006 sec. Unit welds fasteners up to 3/16 in. dia. to ferrous and non-ferrous metals. *K S M Products, Inc.*

190—"Tranfo" Package Load Center substations economically meet electrical distribution needs for 90% of industrial applications. Ratings from 45 to 3000 kva. for stepping down primary voltages 2.4 to 13.8 kv.; secondary, 208/120 to 600 v. *I-T-E Circuit Breaker Co.*

191—Classifier, in sizes to handle from 100 lb. to 100 tons of material per hr., separates dry fines from coarse materials with high efficiency. Unit is useful in classifying fibers; metal, food, and resin powders; salts and crystals, etc. *Buell Engineering Co.*

192—LP-Gas Appliances for soldering, heating, and brazing include stems in six sizes and enclosed-flame soldering iron stem, all of which fit interchangeably on three torch handles made for both air-acetylene and LP-gas. Includes adjustable pressure regulator. *Linde Co.*

FACTORY / EQUIPMENT NEWS

Begins on page 108

For more about these items, circle item numbers on Reader Service Card next to back cover.

193—Laboratory Box Furnace is a compact, low-cost model ideal for laboratories where work loads are moderate. Unit can be used for fusions, assaying, heat-treating small parts. It reaches maximum operating temperature of 1850 F. in 70 min. Work chamber is 4x3⅞x10 in. deep. *Lindberg Engineering Co.*

194—Condenser Tube Cleaner, weighing 10 lb., is one-man-operated, without using any supporting rigging. Single-stage geared air-driven motor provides power to clean clogged tubes up to 1 in. dia. Tool has convenient handle and trigger valve control, insuring fast, easy operation. *Airetool Mfg. Co.*

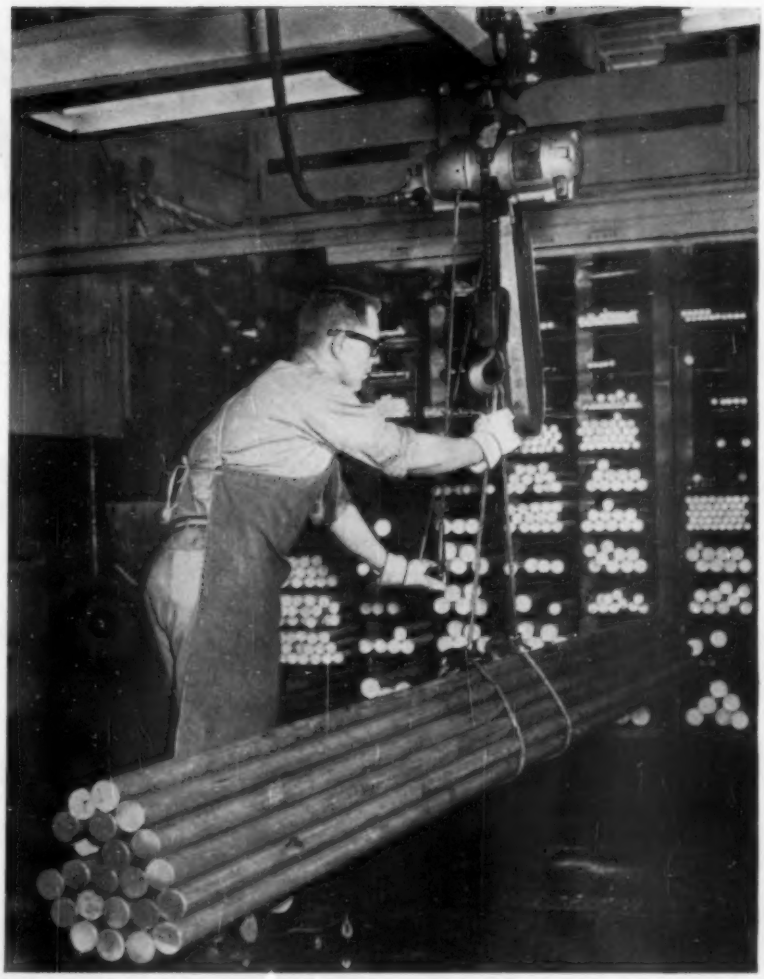
195—"Canned" Filter Pump for filtering expensive, sensitive, hazardous, and critical solutions, houses in one space-saving unit a filter chamber, filter tube, motor, and pump that is magnetically driven by the motor. Models rated 150-1800 gph. *Sethco Mfg. Co.*

196—Forged Steel Globe Valves, suitable for steam, oil, water, and gas lines, are available in ¼-, ⅜-, ½-, ¾- and 1-in. sizes with ratings of 600 psi. at 910 F. in carbon steel and 600 psi. at 1030 F. in chrome-molybdenum steel. *Edward Valves, Inc.*

197—High Vacuum Diffusion Pump offers high capacity at low pressures for plastic, paper, electronic, and other applications. This 32-in. vacuum oil diffusion pump has top speed above 50,000 cfm., stands 82 in. high, takes 38x52-in. floor space. *NRC Equipment Corp.*

198—Split-Eyelet Connectors simplify mounting of spray nozzles of any type to piping and tubing; provide leak-proof connection for liquid, gas, or air lines and pressures to 250 psi. Sizes to fit ½- to 1-in. pipe and $^{13}/_{16}$- to 1⅜-in. OD tubing. *Spraying Systems Co.*

199—Fixed Bore Roller Chain sprockets, marked for size and type, come complete with standard keyway and setscrew, ready for installation. Complete line includes some 425 bore sizes and 99 tooth sizes to fill almost any power transmission need. *Cullman Wheel Co.*



Lift and load in a jiffy

with this handy, powerful air hoist

This Keller Tool two-ton air hoist has just unloaded bar stock from a truck at the loading dock. Now, it quickly transports the material to storage bins. Keller Tool air hoists solve many such hoisting, loading, unloading and moving problems easily and safely.

Positive starting under full load and variable-speed lifting and lowering help the operator complete the entire job in a jiffy. One hand controls the hoist; the other controls the load. Powerful brake holds load regardless of air supply. Secondary safety cable provision further protects operator and load.

Gardner-Denver's line of Keller Tool air hoists is available in lifting capacities of 150, 300, 500, 2000 and 4000 pounds. Request Bulletin 86.

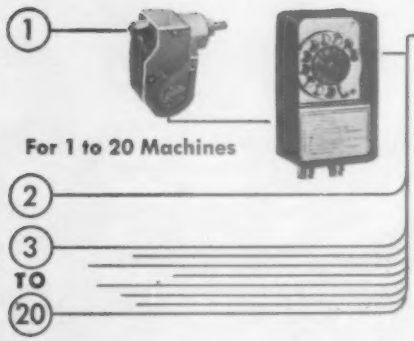
ENGINEERING FORESIGHT—PROVED ON THE JOB
IN GENERAL INDUSTRY, CONSTRUCTION, PETROLEUM AND MINING

GARDNER DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

For more facts circle 530 on Reader Service Card

Thank You!



THIS SPACE
HAS BEEN TAKEN
FOR THE PURPOSE
OF THANKING:

E. I. du Pont De Nemours, Greenville Carpet Mills, Firestone Tire & Rubber Co., Schaefer Brewing Co., Kensico Tube Co., United Piece Dye Works, Cranston Print Works, Canada Dry Ginger Ale, Lever Bros., Lily-Tulip Cup Corp., Presto Plastic Products Co., Fabien Textile Printing Corp., and Carlisle Finishing Co.

FOR having sufficient faith in us and L. M. Ericsson, of Stockholm, Sweden, to have purchased Ericsson's Marvelous Production Recording System — THE CENTRALOGRAPH — during its period of introduction in the U. S.

AND TO TELL THEM that we are happy that in every installation it has increased production by at least 8% and/or provided factual and incontroverible information on production, downtime, setting-up time, and standby time for "costing", incentive system, work norm, quality control, counting, and efficiency records.

AND TO ANNOUNCE that until and including December 31, 1958, orders will be honored at the present ridiculously low prices:

Central Office Equipment, consisting of Recording Head (accommodating up to 20 machines or recording stations), Impulse Converter, Recorder Actuator, Power Supply and Connecting Cords $2750.00
Contactors (for transmitting production recording impulses to Recording Head) ..... $27 to $180.00 each
Dials (for transmitting Reasons for Downtime, Job Numbers, etc., to Recording Head) ..... $64.00 each

Production Item Counters (1 to 2 shifts) with shift switch ..... $750.00 to $1000

AND TO FURTHER ANNOUNCE THAT AFTER THAT DATE, OUTRIGHT PURCHASE PRICES MUST BE MATERIALLY INCREASED.

BUT there will be a second plan by which you can avail yourself of this wonderful money maker and at the same time charge the cost to your *OPERATING* rather than Capital Expense Budget.

THAT IS, you may pay the "Introductory Prices" as an advance rental payment and then pay us a rental fee of $100.00 per month for as long as you use the equipment.

Under this plan, in case you are concerned with maintenance, we, because of the extreme durability of this equipment in normal use, will replace any piece or part should it fail within 5 years of delivery due to causes unrelated to abuse, fire, and other such damage beyond our control.

WE SUGGEST YOU ACT PROMPTLY! **LITERATURE ON REQUEST.**

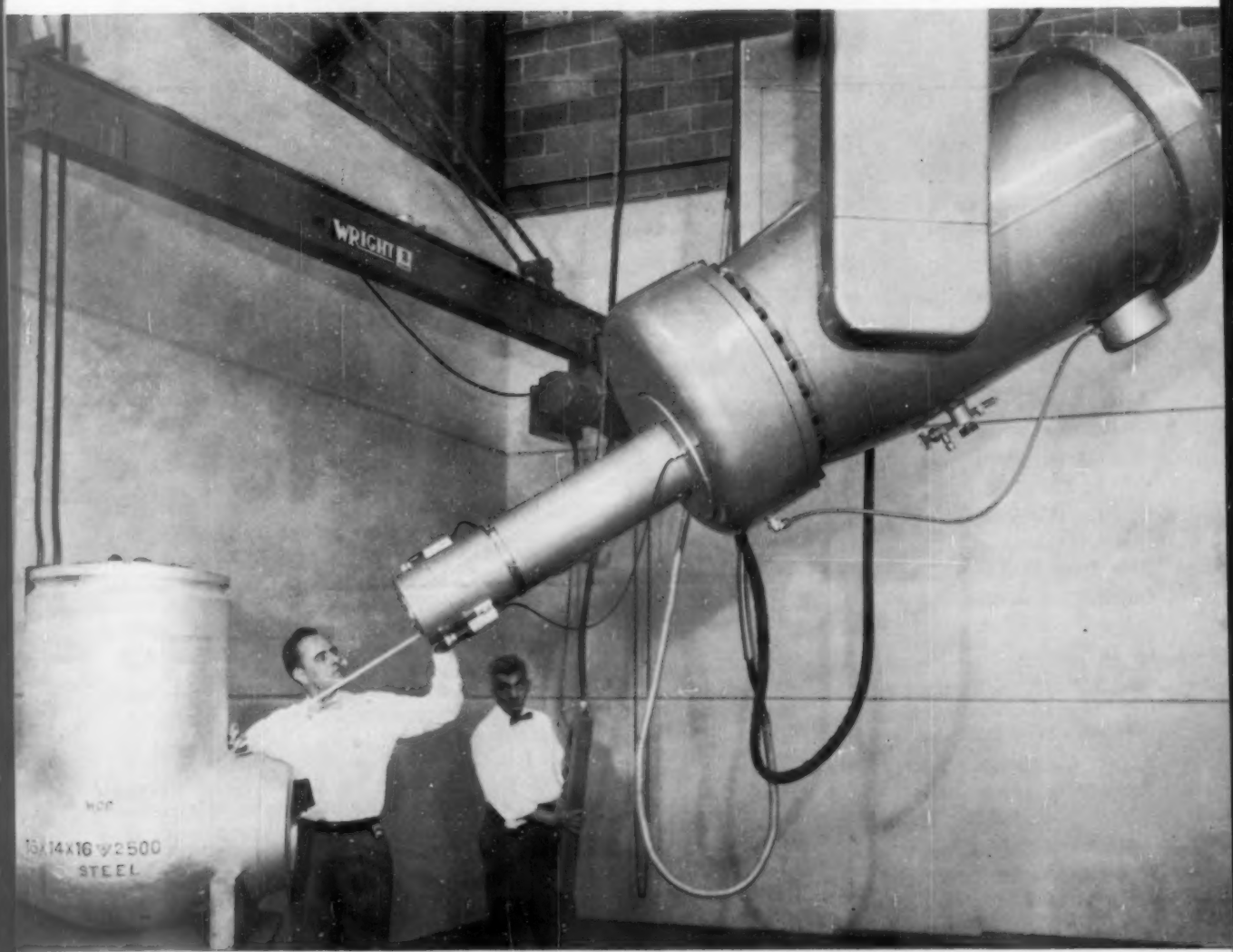
D. C. McGIEHAN, 172 South Broadway, White Plains, N. Y. **Phone White Plains 9-0990**

FACTORY
MANAGEMENT AND MAINTENANCE

PLANT OPERATING MANAGEMENT

CASE BOOK

WARREN J. KING: EDITOR



TWO-MILLION-VOLT X-RAY CAN DETECT THIS HEAVY CASTING'S INNERMOST SECRETS . . . PAGE 143

'59 PLAN

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1. PRESSES BUTTONS ON 46 TYPEWRITER KEYS AT ONCE.

Five Modernized Methods

Faster payoffs from modernization projects are the order of the day at Smith-Corona, Inc. (Syracuse). The five examples shown above represent an expenditure of $86,000. They'll all pay for themselves from savings in less than a year—two in as little as four months.

Except to demand faster payoffs from modernization projects, last winter's downturn in business had little effect on Smith-Corona's spending plans. The company continued to modernize its facilities to the tune of roughly $400,000 each quarter, went ahead with plans for a new multi-million-dollar manufacturing plant at Cortland, N. Y. As a result, Smith-Corona found itself in one of the best competitive positions in its history when business improved in late summer.

Interested? Well, here are details of five (photos above) of Smith-Corona's many fast-payoff projects:

1. PAYOFF: FOUR MONTHS

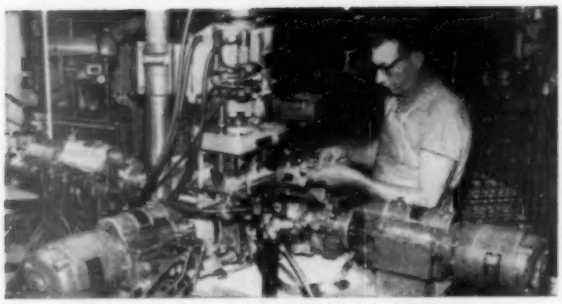
Gone are the days when typewriter keyboard identification buttons were fastened to keys individually. Now all 46 buttons go on at once. Some fancy tooling by Smith-Corona engineers on a new 5-ton press (Hannifin Press Company, Des Plaines, Ill.) can be thanked for the improvement. And all for a total investment of $9000 that was recouped in four months.

The new arrangement calls for the pre-assembly of key levers at an adjacent work station. The press operator places a key-lever set into a die carrier, then slides it under the press head where a slotted die properly positions each lever. If the die carrier is improperly positioned, microswitches keep the press from tripping.

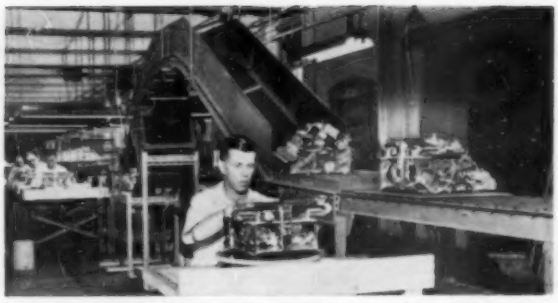
Next, operator positions a nest carrying 46 identification buttons over ends of the keyboard levers in the slotted die. Tripping the press brings down a bank of stepped punches to secure the buttons. Total pressure applied: 2½ tons.

After the operator removes the lever assembly with key buttons in place, she sends it to the next operation. Here springs and links are attached. A total of 572 parts go into each standard keyboard package before it goes into a machine.

The new method has some good

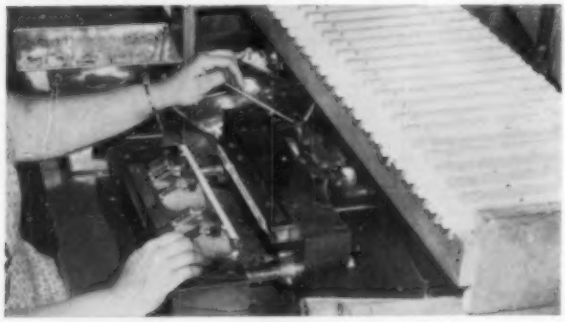


2. MACHINES 23 HOLES WITH SIX HEADS.



3. SAVES 10,000 SQUARE FEET IN ASSEMBLY.

4. SPINS STUDS TO STEEL LINK



5. ASSEMBLES 10-PART TABULATOR GUIDE.

Yield Extra Fast Payoffs

extra benefits as well. For instance, Smith-Corona saves daily some 700 buttons that used to get cracked during assembly. And over-all keyboard quality is improved, too.

2. PAYOFF: SIX MONTHS

More accurate location of holes resulted from installation of this six-headed multiple drill. The custom-built machine cost $17,000. Ettco-Emerick Company (Brooklyn) designed it especially to solve a Smith-Corona problem.

The machine drills, spots, faces, and counterbores 23 holes on type-bar segment mountings for manual and electric typewriters. It taps all but four of these holes in a second operation after the operator changes heads. Set-up changeover for tapping or to accommodate another model mounting takes the machine operator two to three hours.

The machine sequences automatically after the operator positions the workpiece and secures it with air clamps. After the six multiple heads run through their predetermined cycle, the air cylinders back off automatically and then the operator removes the finished mountings. (The sixth head—not visible in the above photo—operates vertically under the part.)

Formerly 13 machines did the same two operations now performed on this single unit. And holes were never located so accurately.

3. PAYOFF: ONE YEAR

This aisle bridge is part of a $50,000 major plan to conveyorize and modernize final assembly, packaging, storage, and shipping on the sixth and seventh floors of the Smith-Corona plant. Estimated savings will pay for the entire project in less than a year. One of the most impressive benefits is a 10,000-sq.-ft. floor space saving in the assembly area alone.

The new arrangement involves two-thirds of a mile of conveyor. In some instances, conveyor runs have two (photo) or three tiers. Purpose of the extra tiers is to mechanize the backtracking of rejected units to previous operations for repairs. At the same time, these tiered conveyor sections add up to valuable floor space savings.

To avoid disruption of normal aisle traffic, Smith-Corona uses several overhead bridges. The 23-ft. long bridge shown above gives 6½-ft. clearance over a cross aisle leading to an elevator entrance. It cost $1330. Machines on Masonite pallets approach and leave bridge on roller conveyor, travel across it on a rough, power-driven belt at 45 fpm. Guard rails prevent machines from falling off bridge while sections of Dexion angle provide a guard rail around drive unit. The bridge, like most of the conveyor used, was supplied by Lamson Corporation (Syracuse).

4. PAYOFF: ONE YEAR

Automatic spin fastening of two tiny studs to a steel link takes two seconds with this indexing set-up. This way, an operation that used to need two workers is just right for one. Net result: Savings will pay the $9000 cost in one year.

Vibratory hopper (right of photo) feeds tiny studs to two cavities on indexing table via flexible copper tubes. Operator fits link over two studs as they index past her work

station. Soon afterward two spinning heads at successive stations (left), operating under 80 pounds of air pressure, secure the studs. At the next station air sucks the link assembly from the table.

The operator controls operation of the indexing table with a pedal. If she keeps the pedal depressed, the table indexes automatically on a pre-set cycle. Releasing the pedal stops indexing.

5. PAYOFF: FOUR MONTHS

Design changes of tabulator keystem guide made the old assembly methods obsolete, made it necessary to position the guide bar on five levers before forcing four key tops in place. Formerly, key tops had been assembled to levers with specially designed pliers, then fitted to the guide bar.

To streamline the new assembly method Smith-Corona engineers designed the pneumatic fixture shown in photo (p. 141). It cost $1000 but will pay for itself in four months in labor savings. To assemble a keystem guide, operator places four key buttons in fixture cavities (right of photo), fits five levers in holding nest (left), and places the guide bar over the ends of the levers. When she actuates the pneumatic system with two release levers, 200 pounds of pressure secures the tops to the levers.

Ballast Sling Ends Worries

A new holding tool makes the job of replacing overhead light fixture ballasts easy and safe at International Business Machines' San Jose (Calif.) plant. Adaptable to any open-type fixture, the device makes it almost impossible for a heavy ballast to fall on workmen below. And while repairs are done with the fixture de-energized, the tool is made up almost entirely of high dielectric material for added safety.

In use, tool is centered under ballast and is strapped tightly around fixture. Nylon setscrews tightened against the ballast lock it in position. This lets the electrician work with both hands to disconnect ballast and mounting screws. Then setscrews are backed off and ballast is slipped out from either side. Next the replacement ballast is slipped into place and the operation repeated. When the job is complete the setscrews are backed off, the quick release buckle opened, and the tool removed.

Harness Boards Now Made Flexible

Electrical and wiring set-ups come easier at Convair Division of General Dynamics Corporation (San Diego), thanks to these new harness boards. Boards are adjustable, operate by removable pegs similar to cribbage boards. They simplify the complex wiring instructions for Convair's 880 jet transport.

The company estimates that it saves 1600 square feet of storage space with the 2x8-ft. boards. Set-up boards formerly were stored indefinitely. These new ones can be knocked down easily as soon as the photograph of a particular set-up has been made, and can then be used for another job. All together, there are 865 different wiring arrangements for each jet aircraft.

About 25 harnesses can be set up in a day. Then they're photographed. Three photocopies serve as permanent records, two go to planning, and one goes to tooling for later transfer to assembly records.

"Baloney Slicer" Updates Cutting

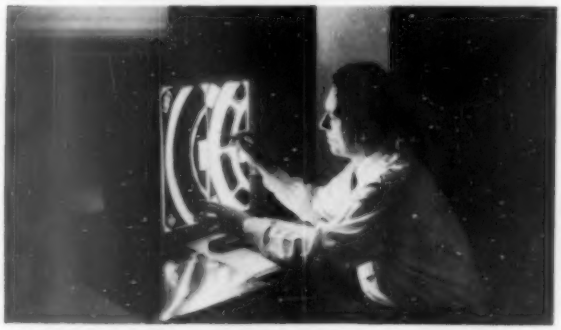
This sharp, whirling blade (photo) cuts honeycomb material to exact size for B-58 supersonic bombers at Convair Division of General Dynamics Corporation (Fort Worth). Turns out 50 cores per shift compared to a maximum of 14 with other methods. The honeycomb core is placed between aluminum sheets, laid up in forms, bonded into a single panel. Then panels are attached to aircraft framework.

To fit the core material to slugs or stiffeners within each panel, intricate clearances are often necessary. That's where this "baloney slicer" comes in. It makes straight or curved step cuts as well as internal and external peripheral ones. Has an over-arm stylus to follow curved templates while an adjustable bar provides for straight cuts. And it holds depth dimensions to plus or minus 0.003 inch as it slices through the honeycomb at speeds from 10 to 60 inches per minute.

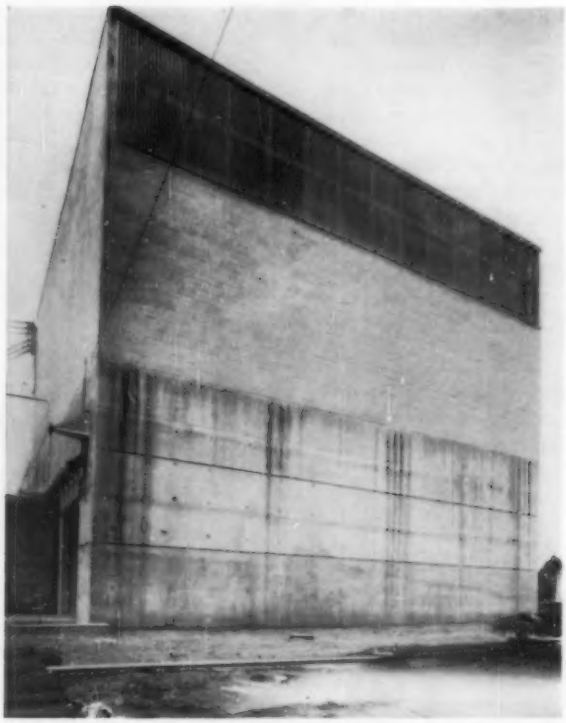
To make the "baloney slicers" Convair engineers modified a Delta wood shaper (Rockwell Manufacturing Company, Pittsburgh), equipped it with a 38x50-inch steel work table. Original vertical spindle of shaper turns a single disk blade that makes a horizontal cut. Meanwhile an air motor rotates a chip breaker (not visible) to remove surplus material. Mounted below table-top level, on a horizontal shaft, the chip remover can be either a four-pointed blade or a disk.

Cost of the entire set-up including modifications was $600. But it's so simple to operate that even semi-skilled workers can use it after a short training period.

GAMMA-RAY AND X-RAY UNITS THAT TAKE . . .



DETAILED VIEWS OF HEAVY CASTING WALLS . . .



ARE HOUSED IN SPECIALLY DESIGNED BUILDINGS.

Now Testing Is Eight Times Faster

(Cover story)

Putting up-to-the-minute radiographic inspection facilities "on stream" involves a lot more than just buying some expensive equipment. It also requires erecting a specially designed building to provide protection against radiation. And to get the most out of the test facilities, materials handling methods must be efficient, too.

But the end results are well worth the trouble, according to American Chain & Cable Company's ACCO Steel Casting and R-P&C Valve Divisions (Reading, Pa.). At this plant they can now inspect eight times as many castings by radiographic methods as they could formerly. With the new equipment average exposure and set-up time ranges from five to seven minutes. At this rate, ACCO expects to process roughly 33,000 films annually compared to 3600 in the past.

Two ultra-modern pieces of radiographic inspection equipment are responsible for this major advance in non-destructive testing at ACCO. One is a 2-million electron volt Van de Graaff radiographic generator (cover photo) for x-ray inspection of heavy castings. The other is a 10-Curie source of Cobalt 60 (photo, upper left) for gamma-ray inspection of lighter pieces.

Both these non-destructive testing units are designed for maximum mobility and flexibility. The 2-million-volt generator itself is the fixed type because items being radiographed can be moved to it. But the unit's accelerator tube, enclosed in a pressurized tank, is suspended from a 7½-ton bridge crane. This allows technicians more than adequate freedom of movement to focus the unit at just the right angle before x-raying a casting.

The 10-Curie source of Cobalt 60 is even more portable. Its specially designed, wheel-mounted container uses 850 pounds of lead for shielding. But the unit can be moved about the testing chamber with surprising speed and ease.

Housing these units to provide complete shielding from the penetrating radiation of x-rays and gamma rays was a problem in itself. It was solved by construction of the massive, vault-like structure (photo, right). Here complete facilities are provided for all phases of radiographic testing. The building itself rests on a solid concrete foundation and on 47 piles driven 25 feet into solid rock.

In the section that houses the 2-million-volt generator, the high-density concrete walls are 48 inches thick. These absorb the radiation generated during x-ray exposures. The motor-driven, sliding access door to this part of the building is also 48 inches thick and weighs roughly 5½ tons. It can be opened or closed in a matter of seconds to permit the passage of work or personnel into the chamber. Walls in the gamma-ray section are 24 inches thick. Access to this area is provided by a second motor-driven door weighing about 2¼ tons. Throughout the building winding corridors designed to stop radiation exposures permit passage of personnel from one section to another.

To make the radiographic operation as efficient and self-contained as possible, films are developed and interpreted (photo, lower left) in same building. Darkroom, control

room, and viewing room facilities are also surrounded by 4-ft.-thick high-density concrete walls.

To get maximum usage from the new equipment, materials handling is of paramount importance. For this reason, ACCO constructed special concrete roadbeds leading from cleaning rooms to new test facilities. Over these, lift trucks transport castings ready for testing.

Inside the testing rooms, 3½-ton jib and bridge cranes position castings for x-ray and gamma-ray inspection. In the 2-million-volt x-ray test chamber, castings rest on a huge hand-driven turntable. This further aids technicians in positioning each casting easily and quickly, as well as accurately.

Racks Cost $6000 But Save $15,000

Ten newly designed etching racks (like the one above) will save Ryan Aeronautical Company (San Diego) an estimated $15,000 in the next year. And all for a $6000 investment —$600 per rack. The new units provide greater protection for parts being etched. Also reduce handling time sharply before and after the etching process.

Each rack body has 32 U-shaped slots made of aluminum rod covered with neoprene rubber. Over each slot are snuggly fitted rubber rings that can slide up and down. Purpose of the rings is to secure individual parts firmly in the racks and at the same time prevent them from touching other parts. The rings eliminate the need for clamps, wires, or other holding attachments.

Each rack with parts already in place is delivered to the etching department on a special dolly from previous operations. After etching, parts and rack return to the dolly for transfer to the next operation—spot welding. Here parts are removed from the rack as needed. Key benefit: Racks eliminate much handling at the etching tanks.

Makes Old Look New

A coat of paint can work wonders in updating plant office equipment and furniture. That's what Gillette Safety Razor Company found in its Boston plant.

For the past five years Gillette has developed a habit of refurbishing hundreds of wooden desks, chairs, tables, and cabinets with a multicolored spray paint. This is the paint you apply with one spray gun, using a single liquid mixture, to produce a spatter pattern in two or three distinct colors.

What started this program was the contrast of the dingy oak-finished furniture as new, modern steel units began flowing in. The old wooden furniture was still too good to heave out. But it sure looked dated, dirty, and worn.

So Gillette tried the paint cure. A trial with a gray-green combination transformed office desks and chairs into fairly modern, smart-looking equipment. The idea caught on for other items, too.

Take the cafeteria, for example. Some years ago it was newly outfitted with about 25 attractive hardwood-topped tables, with chairs in matching style and color. After continued washing, the original surface finish wore off to the clean but bare surfaces. No less serviceable, but not exactly cheerful or high-toned. Refinishing with conventional clear coating looked too costly. Instead, Gillette tried a coat of spatter paint in tan with red and white dots on one set. The effect was so pleasing that all cafeteria furniture got the same treatment.

That was three years ago. Despite severe service the surfaces are still excellent. Surface nicks are few and far between. A simple touch-up job by a hand sprayer, says the maintenance foreman, will make any worn spots that may eventually appear look like new.

Another use for the multicolored paint was in finishing the interiors of several rooms of a new section partitioned off as a chemical research laboratory. The whole area was sprayed with an attractive light green enlivened with flecks of darker green and white. Application cost was reasonable.

How much the multicolor décor raises the morale of workers is anybody's guess. It's certainly a plus value. What *has* come out of this program is best measured by the words of one observer: "There doesn't seem to be much wrong with our old furnishings that a coat of splatter paint won't cure."

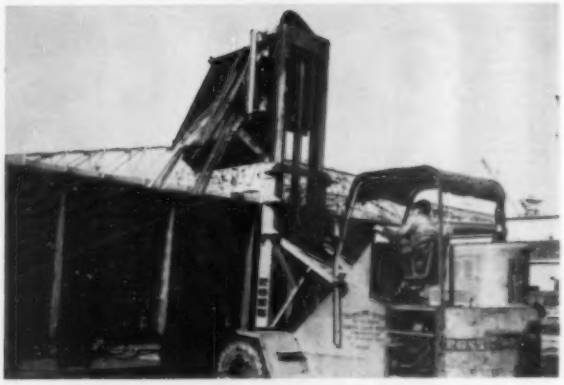
Sky Hook Hangs Shield Just Right

Plexiglas safety shields protect lathe operators from flying chips at Adamas Carbide Corporation plant. These "sky hook" mountings are simple, yet completely effective.

Each shield is roughly two feet high, as long as the lathe bed. Shield is suspended from a chain yoke connected to the top corners. The yoke, in turn, is connected to a counterweighted rope that passes through a ceiling-hung pulley. Meanwhile two horizontal arms, made of thinwall conduit, fasten to the wall with hinge brackets to minimize any lateral movement of shield, but don't prevent operator from moving shield up and out of the way. A simple handle lets the operator move the shield to any position effortlessly. A piece of plastic tubing split down the middle protects the bottom edge of the shield.

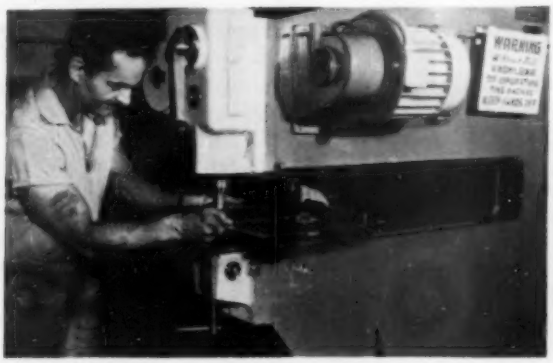
Source: Gerard Scheyer, Plant Engineer, Adamas Carbide Corporation, Kenilworth, N. J.

1. EXTEND ROOF LIFE 5 TO 10 YEARS.



2. MAKES HANDLING SIX TIMES FASTER.

3. CUTS PRIMARY OUTLET REQUIREMENTS 66%.



4. PERFORMS ALL SORTS OF CUTTING.

Modern Methods Scuttle Maintenance Costs

At first glance you're probably wondering what an article from a shipyard is doing in FACTORY. But a second look at the four pictures above, taken at Bethlehem Pacific Coast Steel Corporation's San Francisco shipyard, will immediately answer your question. These four ideas cover the same ground as that in your own plant organization—so they may solve similar problems that you are facing. Sound logical? We hope you may be able to use at least one of these ideas from Bethlehem to help cut the cost of maintenance in your plant.

1. Roof spraying with a water soluble asphalt emulsion prolongs the life of corrugated sheetmetal covering Bethlehem Pacific's warehouses and other buildings as much as from 5 to 10 years. The yard's proximity to San Francisco Bay exposes everything to the corrosive action of salt air. This could cause unprotected roofing to pit and rust, would necessitate replacement within a few years. But some roofs protected with the asphalt emulsion are serviceable even after 18 years. Bethlehem Pacific maintenance crews apply the emulsion about every seven years.

2. Special rotating head on fork truck does in two man-hours the work that previously took 12 with a crane. The 5-ton capacity unit dumps scrap steel into railroad gondola cars (photo), refuse into dump trucks, or sandblast waste into a stockpile. Bethlehem Pacific also has another fork lift truck with a rotating head of 7½-ton capacity to do even heavier jobs.

3. Triple-mounting welding transformers and wiring each unit in single phase reduces the number of required outlets on the primary side by two-thirds and assures a balanced load. The three units rest in a single specially designed steel frame, are delta-connected on the primary side, star-connected on the secondary side.

Bethlehem Pacific engineers designed the frame. They say it's more compact, offers greater portability, reduces cable requirements, and takes up less space. All units plug into one 100-amp. switch.

4. All types of cutting can be performed on this new universal shearing and forming machine in Bethlehem Pacific's sheetmetal shop. It permits straight cutting, beading, slot cutting, irregular or freehand cutting, circle cutting, and joggling or offset cutting of sheetmetal up to $^{9}/_{32}$-in. thick. By raising the upper cutting tool the operator can insert or remove work. This permits inside cutting without a starting hole. The machine also handles dishing or louver cutting.

Source: Bernard C. Flett, Plant Engineer, Bethlehem Pacific Coast Steel Corporation, San Francisco.

New Speed for Order Picking

An automatically routed order-picking conveyor is one outstanding feature of a completely coordinated, plant-wide handling system at Western Electric Company's new Solon (Ohio) repair and distributing facilities. New conveyor sidetracks order-carrying hampers at stations where pick-ups are required, lets them pass other stations. Thus this specially engineered installation (installed by The Alvey-Ferguson Company, Cincinnati) saves time by eliminating non-productive stops, minimizing walking by order-pickers.

The above photo shows the dispatcher plus the first order-picking stations. An electrically operated pneumatic transfer at the dispatcher's station places order-picking hampers on routing carriers. After setting the carrier's routing tabs to discharge at all stations required by the order, dispatcher starts the carrier down a belt-driven live roller conveyor line.

As the carrier reaches a required pick-up station, its selector tab strikes a limit switch actuating a deflector. This shunts the carrier with its hamper outward onto a gravity conveyor running parallel to the live roller line. Here the order pickers load the required parts and other equipment. Then they push carrier and hamper back onto the live roller conveyor for transfer to next pick-up station.

Carriers with completed orders return hampers to the dispatching station by means of belt and roller conveyors. Here items are checked against the order, then forwarded to the packing and shipping area in the same hamper used during order-picking. The control panel (foreground) indicates the traffic pattern along the entire order-picking route.

In the rebuilding area parts and equipment in aluminum trays travel automatically from one operation to the next. Pre-set pin deflectors take care of routing these trays. In this area a belt conveyor runs the full length of the shop. For added efficiency the belt return of this conveyor is load bearing. This provides a second conveyor, tiered under the first and running in the opposite direction. Spur lines of the gravity roller conveyor leading to the various work areas are also tiered two-high.

Keeps Tabs on Tools

A new system for requisitioning inspection tools and test fixtures makes sure they don't stray from toolcribs at Burroughs Corporation's Plymouth (Mich.) Division. Result is the tools are kept in circulation, not hoarded in workers' toolboxes. This means that cribs can now keep just the right number of inspected tools on hand—no longer need an over-supply.

Workers present identification cards to toolcrib clerk when withdrawing tools. Clerk uses these cards (similar to a charge plate) to imprint worker's badge number on a color-coded tool requisition card. Clerk tears off the stub of the requisition card and places it on the shelf from which the tool is taken. Rest of card goes into the crib attendant's file. When tools are returned, the stub is removed from the shelf and the employee gets a receipt for the returned tool.

The color code of tool cards denotes seven-day periods. This helps crib attendants run a quick check of overdue tools by walking along the shelves and checking the color of stubs. Under the system most tools must be returned in 14 days. Those withdrawn for an indefinite period get white cards.

Today It's Paperwork in Just One Move

Streamlined communication is paying off in time and money at Providence Paper Company (Providence). Key: a teletype line connecting downtown general offices to the suburban warehouse. Equally important: a new 8-copy order blank filled in on teletype. All adds up to less effort—the time of one office clerk eliminated—and better service.

Teletype operator relays each salesman's order to warehouse personnel as soon as received. In doing so, she simultaneously produces eight copies of the order—five at the sending end and three at the warehouse. Copies at the office end serve as billing invoice (two copies), accounts receivable voucher, sales manager's copy, file copy. The three at the warehouse are delivery form, packing form, file copy. This eliminates all writing at the warehouse, lets warehousemen concentrate on filling orders.

Cost of each 8-part form is less than 5¢. Rental for teletype is less than $70 monthly. Previously salesmen wrote each order in triplicate, office staff typed four additional copies, and shipping clerk wrote by hand a delivery receipt, packing form, and follow-up slip.

Two Controls Reduce "Squeaky-Wheel" Complaints

"What's happened to my request for reconditioning the cylinder winding machine?" "When am I getting that new indicator?" "How about some action on the clogged dust collector?" Constant questions like these sap an engineer's time, cause pressures in setting work priorities on installation of new equipment or renovation of old.

"Squeaky-wheel" complaints are a thing of the past at General Electric's Rome (Ga.) plant. Two controls—a monthly project activity report and a weekly scheduling meeting—have eliminated the irritation. These insure fair treatment in fulfilling requests for expense and capital investment projects. Each request is logged and reported on at least once a month—even if not completed during that period.

To make sure that no request is slighted, representatives from plant engineering, maintenance, and advance manufacturing engineering hold a weekly scheduling meeting. They establish priorities on the basis of which projects will do the most good. Of course, scheduling is also influenced by material deliveries, dates of engineering instructions to maintenance, and coordination with contractors.

Result of these procedures:

- Crash programs have become a thing of the past.
- Plant engineering effort gains stability, effectiveness.
- Everyone in operations knows his project gets attention.
- Improved communications help plant engineering to keep first things first.

Work requests originate in all corners of the plant. But they must have preliminary approval by the superintendent of the area where they originate. This simple rule eliminates 20% of estimating load.

After screening, requests flow to one office, the supervisor of advance manufacturing engineering (AME). He analyzes and distributes each request to plant engineering, maintenance, laboratory, and toolroom for basic estimates, then arranges all sub-estimates for the specified amount for executive approval by manufacturing, engineering, and the general manager. After getting a shop-order charge number from accounting, he places the job in the active load schedule. When plant engineering completes the final design, it issues specifications and instructions for the maintenance department or an outside contractor.

Basically jobs are placed in the order received, subject to priorities called for by changes in the plant's sales capacity or in its cost reduction program. Actual job control is exercised in a weekly meeting of plant engineers (who prepare the estimates), equipment procurement specialist, and maintenance planner. Each active job is reviewed as to status of material delivery, engineering instructions, or other data affecting its progress.

Such a meeting allows full support among all people responsible for the disposition of work requests. Knowing the needs of each department, they can establish realistic priorities based on material deliveries and urgency of work. There's little need for halting in-process jobs now because the maintenance planner can schedule intelligently by having over-all knowledge on all projects. But if a high-urgency job does appear, it's placed at the top.

What part do the monthly report and weekly scheduling meeting play in keeping projects moving and operating men advised on the status of all requests? The weekly meeting is purely an "internal" affair for engineering and maintenance people. It's a communications meeting or clearing house for problems encountered by those attending. It results in a unified effort to expedite completion of scheduled work. The equipment procurement specialist conducts this meeting.

The monthly report goes to 30-odd operating people. The machine and equipment procurement specialist on the staff of the manager of manufacturing facilities and engineering compiles it from a consolidated file of every project and results of the weekly scheduling meeting. Each project file folder contains data on requests, estimates, approvals, special shop order numbers, requisitions, proposals and bids, delivery receipts, correspondence, minutes of pertinent meetings, and any other related information.

First page of the report summarizes over-all facts about projects. Contains totals on active requests on an appropriation basis (over $10,000), projects approved (under $10,000), projects awaiting approval, completed, and canceled, active projects as of beginning and closing dates of report period, and appropriation requests completed or approved during the report period.

Supporting pages list requests carried over from the last report or added since then. Each is itemized by request number or appropriation number (if it so develops). It is described in four to six words, lists equipment needed, dates of purchase orders, dates of receipts or expected deliveries, and actual or expected completion date.

In short, the report is a running status record of all projects. Those dying an early death are marked with the cancellation date. Those stalled have the reason noted. Everybody knows the fate or status of his own request.

This doesn't mean that supervisors swamp the plant engineering organization with uneconomical requests. Sections still operate within a budget. But it does mean that approved projects are worked on in the sequence that does the most good. And any schedule change has to be thoroughly justified.

Source: L. Herbert Clark, Manager, Manufacturing Engineering & Facilities, Medium Transformer Department, General Electric Company, Rome, Ga.

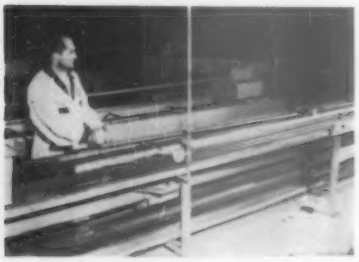
Production Men Help Modernize

"Production men aren't millwrights, but they sure know the machines they've worked on." That was the feeling at Van Norman Machine Company (Springfield, Mass.), a division of Van Norman Industries. And it kept 20-odd production men on the payroll during the recent downturn in business. Their job: helping maintenance men modernize the company's three-story plant to improve efficiency. The project is expected to pay off within one year.

Plans for renovating 80,000 square feet of production space were

developed some time ago. Changes were aimed at cutting assembly costs 10%, materials handling costs 20%. Slack business conditions during 1957-1958 provided a perfect opportunity to do the work. Decision to use production personnel in the renovation was based on desire to keep skilled employees on the payroll. Union contract allows "temporary transfer to any other department or job." And union officials were quick to see benefits if the job were done by employees who would otherwise be subject to layoff.

Problem was to make job efficient in spite of workforce unskilled in maintenance crafts. Pre-planning was stressed. Entire layout was drawn to scale, placed on large tables. Equipment and other movable fixtures were represented by scaled templates. Planners anticipated and solved problems connected with removing wall sections, widening doors, and similar jobs at Saturday morning "skull" sessions.



Shortens Metal Hose in Jig Time

The cable-controlled cart (right) riding on a 26-ft. work table makes it easy to compress flexible metal hose at Titeflex, Inc. (Springfield, Mass.). And it reduces 18-ft. lengths of convoluted hose to 6½-ft. flexible solid tube 30% faster than the old hand method.

After this operation, a cover is braided over the metal hose and end fittings are soldered in place.

The set-up handles hose with diameters that range all the way from $\frac{3}{16}$ to 6 inches. After being placed on the proper size mandrel, the length of metal hose is placed on the work table so the cart straddles one end. As soon as the operator releases an air valve, the track-mounted cart starts traveling rapidly toward the opposite end of the mandrel, where the hose is held in place by a spike. A large air cylinder with a reciprocating plunger arrangement moves the cart cable back and forth, along the work table.

Updated Controls Pay Hot Dividends

Central control for the plant heating system at Westinghouse's huge East Pittsburgh works proves to be an outstanding example of payoff through modernization. It cost approximately $80,000. But it saves 150-million pounds of steam and 1300 man-days a year.

In the new central control system (photo) individual pushbuttons control fan-motor starters at each central heating unit fan. Adjacent pushbuttons control operations of corresponding motor-operated steam valve. Relays are interlocked so steam cannot be turned on unless fan motor is running. Steam valves use slow-opening operators (4-5 minutes) to prevent water hammer or unequal system expansion.

Where direct radiation is used, only a single relay is needed to control the steam valve. Above the control board is mounted a recording thermometer that keeps tabs on average temperatures in each shop and office by means of remotely located resistance thermometers.

Thanks to this central control it takes 415 man-days per year to service the plant's heating systems. Used to take 1730. And because steam flow to each building can be reduced as soon as it's no longer needed (without waiting for a patrol serviceman to arrive), Westinghouse has been able to cut annual steam consumption from 750-million to 600-million pounds. In fact, the whole heating system can be shut down in one minute if necessary. Normally the power plant switchboard operator takes temperature readings every hour, thus maintains constant control on heating levels to keep shop temperatures at a comfortable level.

A bonus advantage to Westinghouse is the simplicity and speed with which steam can be diverted from the heating system to take care of temporary peak loads imposed by process or electrical requirements.

Previous to the installation of the new system, a patrol of heating and ventilating inspectors controlled the flow of centrally generated steam to widely scattered heating units. Large control-type unit heaters with ductwork distribution systems heat the main shops while individual offices rely mostly on direct radiation (some have central air conditioning units).

Source: C. J. Zetler, Jr., Plant Engineer, Westinghouse Electric Corporation, East Pittsburgh.

Rain Spots Leaks

Wait for rain to find the leaks in your plant's hydrogen tanks? That's just what Adamas Carbide Corporation does. Rain makes leak-spotting easy. Especially when soap is added to aid the detection process.

Adamas stores hydrogen gas for its sintering furnaces in 100 horizontal cylinders stacked four-high in a steel rack. Every five years the gas supplier checks bottles and manifold systems. But five years is a long time to let leaks go without detection. Especially when it just takes a few soap-bubble tests to help spot tiny hydrogen gas leaks around valves and fittings.

Problem was to find a simple, easy-to-use method of getting soapy water on 100 different sets of fittings without an elaborate and bulky set-up. A small hand sprayer filled with liquid soap was the answer. The rain spreads the soap solution all over the surface of the fittings. Then all maintenance men do is mark leaky areas with yellow grease pencils. The gas supplier repairs or replaces the leaky tanks or fittings. Test takes only a few rainy minutes every few months.

Source: Gerard Scheyer, Plant Engineer, Adamas Carbide Corporation, Kenilworth, N. J.

Quality Control Now Up to Date

When quality control is close to 100% efficiency, how do you keep it that way? Federal Pacific Electric Company faced this problem at its Newark plants. Solved it by tightening up on administrative and organizational procedures. Also improved some inspection methods. But didn't alter its basic statistical quality control system at all.

Actually the company's quality level was as high as could be expected. But Federal Pacific wanted more—a system that was foolproof. Only this would insure high-level quality in any and all eventualities, including worker complacency, new materials, new and modified products, changes in shop personnel, revised methods of manufacturing, and all other factors that could strain a quality control system.

To insure the maintenance of quality levels, Federal Pacific embarked on the following seven-stage tightening-up program:

1. Made quality control an independent function. The head of quality control now reports directly to the Newark division manager rather than the production manager. And chief inspectors are on the same level as general foremen. Thus pressures from production people to meet schedules can't be focused directly on inspection. Quality control inspectors are freer to police and control output—even stop an operation any time they note—or even anticipate—trouble.

2. Fostered quality consciousness. With stress on quality as an everyday responsibility for everyone, the over-all quality of production was increased. To keep quality performance figures constantly in everyone's mind, 24-hr.-old statistics are posted daily on charts in each plant manager's office.

3. Created a new job category of Class A inspector. This new category provides a straight-time pay basis to replace the old incentive system. It removes the continued pressure formerly on inspectors to achieve their output bogies. Also helps make inspectors more impartial in their decisions.

4. Transferred roving production inspectors to quality control. But kept their job function the same. This affected most inspectors spot-testing products in subassembly production departments. The transfer was made after a series of indoctrination meetings to introduce the production inspectors to the quality control department's procedures and methods of operation. Then production inspectors began submitting their reports to the quality control department for evaluation and follow-up. Formerly these men made their reports to the foreman of their assigned department.

5. Extended quality control responsibilities to all shop personnel. This was one of the major goals of the tightening-up program. It made workers as well as supervisors realize product quality is each individual's responsibility. The union not only accepted this approach but actively cooperated with management in impressing its importance on all shop personnel. Purpose: to catch faulty units as early as possible in the production process.

Reinforcing the union's effort, quality control inspectors started teaching shop people quality control techniques. This campaign is a continuing effort stimulated by signs and slogans posted throughout the plant. In many assembly jobs workers inspect operations performed by previous operators before doing anything on a piece. Thus shop personnel becomes the advance guard of the quality control inspection team. This means that inspectors are the final arbiters only.

Similarly shop foremen were thoroughly oriented to the quality procedures at meetings. The slant: Better quality control means lower production costs. Specific dollars-and-cents costs illustrated how elimination of re-work and re-inspections produced economies. Result: 34 pairs of eyes were added to the quality control team.

6. Modernized, improved, and increased test facilities. This updated all Federal Pacific's testing equipment. In over 80 quality control centers (photo) throughout the plant, old equipment was modernized, special new test units were designed, and procedures were made more efficient. In one instance this meant the purchase of new micro-ohm testers to function as part of in-line production. In another case, special high-voltage equipment was bought to make in-line dielectric tests. And in a third, testing equipment was installed in the specially constructed air-conditioned humidity-controlled room. As a further aid to quality, equipment in the company's low-voltage testing laboratory was made available for quality control use.

7. Organized a "supernumerary" task force of engineers. Members of the engineering department normally rove through the plant, testing and evaluating random pieces taken directly from production lines. These engineers now constitute a control on quality control, turn over copies of their reports to the quality control department without going through channels. These technical data help quality control discover any weak spots in their procedure. Also keep quality people better informed on the latest developments

in materials, components, product performance, and electrical and mechanical functioning.

In addition to the above seven points Federal Pacific's quality control department took a long, hard look at its internal procedures and methods. The company is now in the process of evaluating its findings in terms of what can be done to streamline these methods, thus make the quality control function even more efficient.

Source: J. J. Sutton, Quality Control Manager, Federal Pacific Electric Company, Newark, N. J.

Do-It-Yourself Way to Update Handling

Special handling problems can't always be solved the easy way. Sometimes a company even finds it has to design and build the right device itself. That's exactly what happened at Chas. Pfizer & Company, Inc. The problem: more efficient handling and storing of 19-in. diameter fiber drums containing 250 pounds of citric acid each.

Formerly Pfizer placed four drums on a pallet for warehousing and handling operations, moved them around with fork trucks. The new attachment (photo) eliminates pallets altogether, handles eight drums at a time. This gives Pfizer the following dollar-saving benefits:

- One-third more drums (1140 vs. 880) can be stacked in normal storage areas by eliminating horizontal space required by pallet overhang. And in one area removal of pallets permits stacking an additional layer of drums, thus boosting space utilization another 33%.
- One man now loads over-the-road trailers where at least two were required formerly. Reason: Lift truck operator places drums exactly where they're supposed to be.
- Some 6000 pallets representing an initial investment of roughly $20,000 are eliminated. And naturally there's no pallet maintenance cost to worry about either.

Special feature of the new attachment is its ability to handle the 29-in.-high drums without crushing or damaging them. A pressure valve in the attachment's independent hydraulic system insures this. Rough-surface rubber pads on the inside of clamps prevent any possible slippage.

Pfizer uses three of these home-made attachments in its warehousing and shipping operation. One is installed on a 4000-lb. Skylift truck, the other two on 3000-lb. Docker trucks (Automatic Transportation Company, Chicago). Each cost $500, can be adjusted to handle 21-in. diameter drums. Steel clamps measure 22 inches high by 30 inches wide, extend 37 inches in front of truck.

Source: Edward F. Gassman, Manager, Shipping, Receiving and Warehousing, Chas. Pfizer & Company, Inc., Brooklyn.

Contributions from readers reporting experiences will be welcomed. No need for fancy writing; just a clear, concise statement of facts. If you have photos or drawings, be sure to include. We'll edit for the Case Book. Contributions accepted will be paid for at time of publication. Address: Case Book Editor, FACTORY, 330 West 42nd St., New York 36.

Inspects and Detects the Modern Way

Generally we associate x-ray and fluoroscope with medical procedures. But increasing emphasis on reliability has forced industry also to adopt these two methods to detect flaws. Especially when dealing with hardware for missiles and high-speed aircraft—as at Aeroquip Corporation (Jackson, Mich.).

Aeroquip has spent roughly $12,000 on a 150-kv. x-ray-fluoroscopic unit. Complete with darkroom, it's used to inspect brazed tube fittings on a production line basis. (Westinghouse Electric built the unit specially for this job.)

Payoff is three-fold. First, the unit catches defects directly after brazing, thus eliminates costly subsequent operations from units headed for the scrap heap. Second, Aeroquip can check operation of brazing and welding set-ups in a matter of minutes. Third, having this equipment readily available eliminates costly delays when parts have to be sent out for inspection.

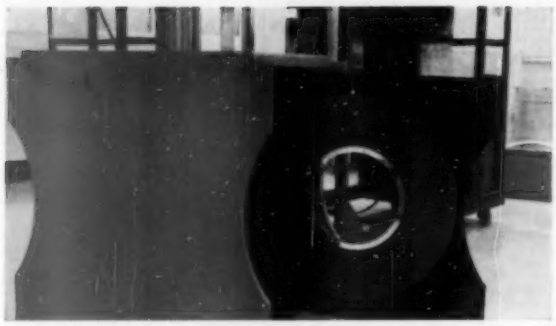
Fluoroscopic inspection is used to control aluminum tube fittings. In this procedure the operator turns the tube in a horizontal position. Then parts are located between tube and screen by hand or by a conveyorized mechanism.

X-rays control the quality of silver brazed carbon steel and stainless steel tube fittings as well as stainless steel, carbon steel, and aluminum welded tube fittings. For this operation the tube is placed in a vertical position to take the radiograph. After development in a nearby darkroom, radiographs are read (photo) by a technician specially trained to interpret defects.

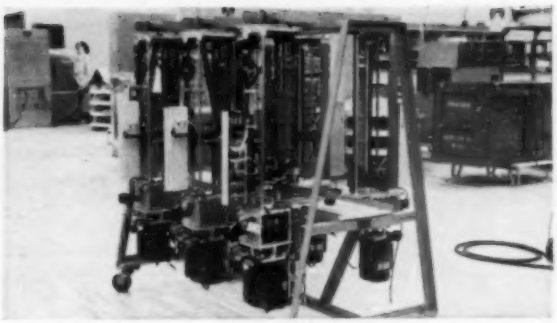
Worker Ideas Soar

Two hundred ideas in four months of brainstorming. And more than 10% of them already in effect. That's the record of Rolled Steel Corporation (Skokie, Ill.). Almost all its employees are involved in the twice-a-month sessions except the "brass." They stay out for fear of discouraging employee spontaneity. Groups free-wheel, solve problems of other departments as well as their own. "Think up or shut up" is the order of the day.

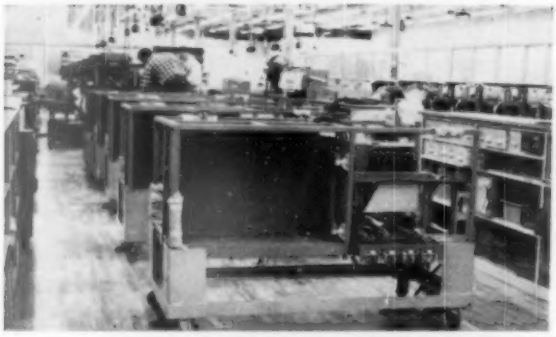
Example of results: Incoming material paperwork was too slow. Passed through three departments before it got to the people who needed it. Employees worked out a way to post incoming shipment data on a master inventory board minutes after it arrived in the warehouse.



1. DELICATE DISKS GET FULL PROTECTION.



2. MACHINE PARTS ROLL ON THIS SPECIAL TRUCK



3. DOLLY RAISES FRAMES TO RIGHT HEIGHT.

4. STORAGE RACKS ARE CABLE CARTS ALSO.

Tailor-Made Trucks Modernize Handling

Assembly operations at International Business Machines Corporation's modern San Jose (Calif.) plant may look confusing. But there's no confusion among workers when it comes to moving computer components to the right assembly place. The most modern, specially designed trucks take care of this.

IBM's big handling problem at San Jose is to protect delicate parts from handling damage, thus assure high quality in the finished product. Special floor trucks have solved the problem. In addition, they reduce handling costs and increase flexibility. The floor trucks weren't expensive to build and aren't expensive to maintain.

The following four examples of smart, modern handling will give you an idea of what IBM is up to:

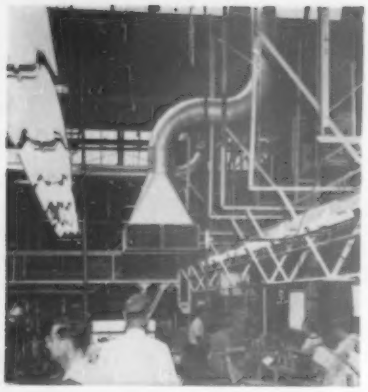
1. Handle with care—Feature of this special floor truck is sliding panels. Each has spring clips to hold two 2-ft. magnetic storage disks (one on each side of panel). The disks are easily damaged. Thus the clips secure the disks away from panel while structure of the truck makes sure disks on adjacent panels aren't scratched accidentally.

Each panel can be pulled out independently. Strategically placed stops prevent complete removal of the panel accidentally, lock panels in place when truck is moving. Each truck cost about $180. But disk damage is way down.

2. No middleman—This truck elimnates bothersome routine of transferring assemblies from a stationary fixture onto another dolly and *vice versa*. IBM simply builds assemblies right on truck, then tests them there. When completed in one department, assemblies roll on to next stage. At present assemblies go through all assembly stations on this vehicle. If they're stored pending any assembly operation, they stay on dollies until they're needed. Cost of each dolly is about $260.

3. Goes easy on the people—No one has to stand on his head to do the intricate wiring on these computer components. These assembly dollies hold units at just the right height. Before IBM designed these dollies, workers tired easily because of uncomfortable positions they had to take to wire the units. The dolly is constructed simply of steel angle as the main frame with fabricated steel uprights that raise the machine some 16 inches above its normal height. Swivel casters make for easy moving and floor locks assure a steady working frame. Each dolly cost $60, but saves far more in worker comfort.

4. No wire tangle—These special trucks protect cables, serve as temporary storage racks, and transport the complex web of wires to the right place at the right time. Production workers select cables at will without need of damaging pulls. It doesn't take much to pull wires from set positions in a connector and thus delay production. That's why loose, vulnerable ends of cables are tucked into the receptacle at the base of the truck. Each truck cost about $200, but savings are far more than that in damage losses.



Gets Fresh Air to the Workers

Does your plant ventilation system provide adequate environmental control at the worker level? It may not, even though it's designed for this purpose. That's exactly what happened in a 272,000-sq. ft. single-story addition at Rochester (N. Y.) Products Division of General Motors.

The original ventilation system was of common design. Used 16 fresh-air supply units installed in trusses approximately 20 feet above floor level. Each unit was capable of delivering 20,000 cfm. at 100% outside air. On paper it was calculated that the over-all system would provide three air changes per hour.

But the anticipated ventilation comfort at worker level was never realized. Smoke tests indicated the zone from 10 feet above floor level to the roof experienced air changes approximately 5.5 times per hour. At the same time the space where workers were (less than 10 feet above the floor) had only 0.5 air changes per hour. Attempts to correct this condition by projecting air downward were unsatisfactory, caused drafts resulting in employee discomfort.

The answer: Bring vent outlets down to where they'd do the most good. And this is just what Rochester Products did in subsequent installations. It placed discharge grills eight feet above the floor (photo) and allowed operators to adjust both spread and discharge angle manually. Thus discharge velocities of approximately 1000 fpm. can be varied according to demands within 40 feet of the discharge grill. The principle of getting air down to the floor is adaptable to either centralized air-handling systems or unit heaters.

Rochester Products engineers say this modification adds only 5% to the cost of an air-handling installation. In return, it increases effectiveness 20-fold by providing the following results:

1. Ventilation at operator level has increased to approximately 10 changes per hour.
2. With cool outside air now introduced nearer the floor in summer months, nearly all employee complaints about heat and contaminants have been eliminated.
3. The need for individual circulating fans has been eliminated.
4. The fear that ventilation drops would interfere with manufacturing facilities has not materialized.

Source: A. M. Beebee Jr., Assistant Plant Engineer, Rochester Products Division, General Motors Corporation, Rochester, N. Y.

Wall Headers Modernize Wiring

Two specially fabricated sheetmetal headers cut installation cost and provide tops in flexiblity for power and telephone wiring in offices of The Stanley Works' new Steel Strapping Division plant (New Britain, Conn.). Headers run horizontally one above other in wall at door-top height.

The headers (they're 6 inches square) serve as a manifold for standard side-by-side floor ducts spaced at 6-ft. intervals. These units run from headers down to floor line, then at right angles across the full length of the room. All fittings except headers are standard distribution system components.

Outlets for phone or power can be added (or removed) in about 3 man-hours. This is one-fourth of the time Stanley figures it would take to fish wires through standard floor duct sections and distribution panels. And material costs were only 40% of a full embedded duct layout with junction boxes, conduit runs, and other paraphernalia.

A local sheetmetal shop built the header duct for the electrical contractor with screw-on front covers along the length. If they were doing it again, Stanley maintenance personnel would prefer hinged covers and a 6-in. vertical divide between the two ducts.

Fast Roof Raising

Job: roofing a 9700-sq. ft. plant addition. Place: the St. Louis bottling plant of the Mountain Valley Water Company. Material: standard Calsi-Crete slabs, a lightweight cellular material (Continental Materials Corporation, Chicago). Each plank measures 20 by 80 by 3½ inches, has a density of 34 pounds.

The project started out as a six-man operation—was cut to three men four hours later when all the material required for the job had been raised to the roof. During this same four hours approximately 5000 sq. ft. of roof area was covered. Then the remaining three men polished off the additional 4700 sq. ft. in one-third the time it would have taken with other similar materials. Shaping was done with a power saw using a masonry blade.

A small hoist engine hooked to a pulley on a gin pole was used to raise the slabs two at a time to the roof. Then workers moved slabs to the approximate installation position with rubber-tired hand trucks. Actual positioning of the lightweight slabs was done by the installers (photo). After joints were grouted (to make them watertight) and slabs were covered with a layer of tar, the job was completed.

Who's "It?" Work Orders Tell

Coordinating many craft specialties on maintenance projects has always been a scheduling and organizational headache. And the problem is universal because even small maintenance jobs often require the use of two or more different crafts. This has led many managers to change their conventional craft attitudes on the operation of the maintenance department.

The "responsible craft" concept is Rayonier's answer to this problem. It retains the traditional craft organization of the maintenance department but delegates project responsibility so foremen expedite small jobs as well as big ones more efficiently. The plan makes one craft foreman responsible for each job, while other crafts involved act in supporting roles. The responsible foreman is designated the "leading craft" or "responsible craft" foreman for the job. The heads of the other crafts involved are known as "supporting craft" foremen.

The approach is simple and straightforward. But it gives the following five advantages:

1. It decreases duplication of effort on the part of maintenance foremen. Everyone knows who is responsible for each project.

2. It allows each foreman to concentrate on fewer jobs, lend a hand on the others.

3. It achieves a more satisfactory completion of projects with all guards replaced, scrapped parts removed to salvage, the area cleaned up, and equipment ready to go because of tighter responsibility.

4. It doesn't conflict with any craft jurisdiction but makes foremen more aware of the over-all job rather than just a craft specialty.

5. It gives the maintenance supervisor flexibility in delegating responsibilities for the work load.

How does the "responsible craft" concept operate? Very simply. During the planning stages of each project the maintenance engineer selects the "responsible craft" and places a triangle around its designation on the work order forms. In the above illustration, millwrighting is the responsible craft. Similarly the foreman draws circles around the initials of each supporting craft (welders, machinists, and painters in the illustration) to show what assistance can be expected on the job. Responsible-craft work order forms are white and supporting-craft forms are blue. This color-coding helps each foreman easily spot the jobs he is expected to expedite.

The responsible craft on a project is usually the craft involved to the greatest extent. However, because some groups (millwrights and pipefitters particularly at Rayonier) are inherently the predominating craft, alternate selection methods are used to spread out responsibility. Frequently the last craft involved in a project is the natural responsible craft—as it is in the most advantageous position to inspect the completed job. Also if a craft works on a project independently after all others have finished, the maintenance planner may issue a responsible-craft work order instead of a supporting-craft ticket. This often occurs in the case of painting. Here it's not desirable to have another responsible foreman delay his follow-up inspection for an extensive paint job.

The maintenance planning staff distributes daily work orders indicating approximate start dates for the project to foremen. As these are released, consideration is given to each craft's work load for the next day by the maintenance supervisor. However, actual coordination between crafts and the assignment of men is the responsibility of individual foremen, with the responsible craft foreman supervising over-all results. To iron out scheduling or coordination difficulties, the maintenance supervisor holds a short daily meeting attended by all maintenance foremen.

Although the responsible-craft foreman is responsible for the over-all job results, he is not responsible for the work quality of supporting craftsmen. When a question of workmanship arises in a supporting craft, the leading craft foreman arranges with the proper supporting craft foreman to correct the condition to his and the maintenance supervisor's satisfaction.

To aid the responsible-craft foreman, the maintenance planning staff defines each job in considerable detail, usually outlines it in a step-by-step work sequence. Also the maintenance clerk keeps supporting-craft foremen posted on completed jobs. This helps foremen keep work order records up to date and free of completed projects.

Three of Rayonier's domestic mills now operate under the responsible-craft concept. The fourth is being introduced to the system now. On the whole the plan's operation is extremely effective. But there are two potential points that should be given special consideration for best results. First, all questions concern-

ing jobs should be consistently referred to the responsible-craft foremen to impress on them their responsibility. Second, extreme care should be taken in differentiating between technical responsibilities and overall job responsibility.

Source: Tom Mostyn, Executive Staff Maintenance Engineer, Rayonier, Inc., Port Angeles, Wash.

Is Your Trademark Up to Date?

If it's not, maybe you can learn something from the experience of the Worthington Corporation, Harrison, N. J. This company has just changed trademarks. Traded in its 73-year-old winged mark for a bold, modern one designed to reflect progressive thinking and flexibility.

Reason for the change: People outside the company didn't associate the old trademark with the company. A poll of engineers attending an annual ASME convention proved this conclusively. Nine out of ten men in this highly selected audience familiar with Worthington failed completely to link the distinctive pair of out-thrust wings in the Worthington mark with the company. They either didn't know whose trademark it was —or guessed wrong in identifying it. Of those who failed to associate the old mark with Worthington, most thought it represented a company in some phase of the aviation or transportation business.

Worthington's management men are taking no chances on people being uneducated about the new trademark. They're making sure the new one will be displayed most advantageously whenever and wherever it's used. A 21-page identification manual spells out details on when, where, why, and how the trademark will be used in the future. Worthington feels proper usage of the trademark as described in this manual will pay big dividends. In any event, the new trademark—a vigorous "W"—is easily associated with Worthington.

Reprints of the Plant Operating Case Book are available. Price 50¢. For quantity prices write Reader Service Department, FACTORY, 330 W. 42nd St., New York 36.

Today It's Three for Five

New methods, new materials, new equipment: three reasons why these three girls can now do a job that used to require five. They do it at a faster rate, too. Combined, these factors add up to a 66% reduction in man-hours in the production of 35mm film magazines at the camera plant of the Ansco Division of General Aniline & Film Corporation.

The first worker in the progressive assembly operation (left) receives lithographed blanks for cylindrical film cases with one end formed. Otherwise the blanks are still flat. She feeds these blanks into a specially designed press fixture, where strips of velvet that have been treated with thermoplastic are secured to the two end lips. In this step of the assembly operation velvet strips are cut to length, heated to activate the thermoplastic cement on one side of the velvet, then positioned and pressed in place. Before the new method was installed, this sequential operation was performed in three individual steps—each one by a different operator.

En route to the second work station along the line blanks travel on a small, constant-speed conveyor. During this transfer the cement has adequate time to dry and the velvet strips are brushed and vacuumed to remove all foreign matter that could possibly harm the film. At the next work station cases are curled into their final cylindrical shape by a press, then transferred to the capping operation.

After the capping operator has placed the curled case in a holding fixture and has positioned a cap on its top, she slides the assembly into an air-operated press. The press forces the cap into place. As a guarantee that this operation will be efficient as possible, properly oriented caps are fed to the operator by a Syntron feeding device. After being capped, the magazines are then placed in special tote boxes and are removed to the film plant. When the film has been inserted in the magazine, the second end cap is fastened in place, and the film is on its way.

Source: Warren C. Hauck, Camera Plant Manager, Ansco Division, General Aniline & Film Corporation, Binghamton, N. Y.

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This "SCOTCH" Brand Tape sticks metal to metal for grinding!

Magnetic grinding chucks offer a quick, clean, easy solution to many metal grinding problems. But what to do with copper, brass, or other non-ferrous metals? Then the quick, clean, easy answer is "SCOTCH" Brand Double-Coated Tape No. 400. This tight-holding tape sticks on *both* sides: simply apply to the chuck . . . then position on the tape the object to be ground. The holding action is tight, positive—the tape strips off clean when the job is finished.

Double-Coated Tape is another example of the many versatile and specialized tapes in the "SCOTCH" Brand line—the world's most complete line of pressure-sensitive adhesive tapes. Other tapes in the line offer the strength of steel . . . some resist acid, alkali, and solvent action . . . many are in a complete range of colors and can be printed . . . most can be dispensed or applied semi- or fully-automatically with "3M-MATIC" taping and dispensing equipment. Ask your "SCOTCH" Brand Tape distributor for further information, or write Minnesota Mining and Manufacturing Company, 900 Bush Ave., St. Paul 6, Minn., Dept. CO-118.

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3M COMPANY

What you should include in your . . .

Guide to Accumulating Operating Cost Data

General Instructions—Rules for conduct of operating cost analysis. For example, such rules as these:

1. Get all the facts you can—facts, not guesses. No cost comparison is true without all the facts. If data are derived from estimates, mark with asterisks.

2. List all factors—tangible and intangible—that you encounter in your analysis. Intangible gains or losses can often outweigh the tangible factors and insure a wise decision.

3. List unresolved factors or problems.

4. Make it an operating cost study. Don't include taxes, depreciation, insurance, overhead, or other accounting charges. Those items will be introduced in the over-all economic study by the controller.

5. Make no allowance for contingencies, thus keep data as pure as possible.

6. Describe relation of project to others (if any).

7. Indicate time expected to complete the project from date of acceptance, so higher management can envision cash requirements.

8. Show (wherever possible) annual figures on costs, output, etc. for five years or for useful life.

9. Use letter-size paper, one side only, for detailed exhibits of calculations. Mark supporting-data sheets with item-number references used in this guide for easy identification.

Specific Guide Points—Specific factors, tangible and intangible, to be checked for possible cost expenditures or generators on new and old equipment (where applicable). For example:

1. Description of installation—Performance, capacity, versatility.

2. Equipment, machine, or facility cost—Purchase price, cost of delivery to plant, insurance in transit, company engineering.

3. Auxiliaries—Pump, cooler, hydraulic power, and d-c power.

4. Process piping—Tanks, traps, valves, hangers, pipe covering, steam tracing.

5. Service lines—Water, gas, compressed air, steam, vacuum, etc., with operating costs.

6. Special plant services—Light, heat, ventilation, air conditioning, fume removal, refrigeration.

7. Power lines—Transformers, transmission or distribution lines, power-factor correction, peak load effect, with cost per unit or per period.

8. Utilization—Number of shifts, idle time, downtime, overhead.

9. Output—Units required, manufacturing forecast.

10. Equipment life—Primary service life of new units; age and remaining service life of old units.

11. Preparatory work—Experimentation, engineering design, foundation, pit, tunnel, trench, etc.

12. Space—On floor, ground, overhead, or new site.

13. Direct labor costs—Direct and fringe costs, overtime, shift premium, training.

14. Indirect labor cost—Set-up, inspection, helpers, direct supervision.

15. Materials handling costs—Equipment and labor for moving, storing, feeding, and transferring.

16. Tool costs—Dies, patterns, molds, jigs, fixtures, gages, grinding wheels.

17. Shop equipment—Furniture, platforms, stairways, man-lifts, etc.

18. Supplies—For manufacturing operations.

19. Special instrumentation—Controls, test equipment, piping, wiring, etc.

20. Special communications—Wired, radio, TV, etc.

21. Extra construction requirements—New structures, land, building, roads, floors, elevators.

22. Extra code requirements—Federal, state, and local government; other codes.

23. Extra protection—Fire, security, safety guards and rails; other hazards.

24. Installation costs—Rigging, licenses, permits, erection; anti-pilferage and security measures.

25. Outside contracts—Installation, operation, maintenance, rentals.

26. Start-up costs—Including debugging and trial and acceptance runs, shakedown adjustments.

27. Equipment upkeep and maintenance costs—Repairs, lubrication, painting, cleaning, etc.

28. Special maintenance equipment—Tools, spare parts.

29. Tool maintenance costs—Including tool changes.

30. Material costs—Raw materials (f.o.b. plant), scrap loss, rework costs.

31. Material changes—In quantity or price.

32. Product superiority—Quality, appearance, etc.

33. Waste—Cost of handling, disposal, special treatment, sewers.

34. Effect on other equipment—Added operations, relayout, rearrangement, temporary shutdown costs.

35. Effect on operations—In-process, finished work.

36. Effect on working conditions—Safety equipment of clothing, rest or sanitation facilities, noise, medical requirements.

37. Insulation—Thermal, protective.

38. Condition of equipment—Including reconditioning cost and service life gained thereby.

39. Disposition of item replaced—Storage costs.

40. Removal cost—Old and new (at future date), also salvage or resale value.

Special Cautions—Precautionary instructions on development of data above. These, for example:

1. To relate annual projections of cost with past history and to permit a fair comparison, furnish whatever reliable indexes are available to adjust for inflationary or deflationary effects on costs of labor and material.

2. If data are more than six months old, check them against current conditions, performance, and costs to insure against serious change.

3. Do not construe added capacity as a benefit unless it's actually needed or will be needed.

4. Summarize any losses, injury, or damage that will occur if new equipment is rejected.

PLAN '59

MANAGED MODERNIZATION

The stakes in modernization are too high to risk guesswork. For sure-fire decisions you've got to weigh all the facts. So here are reliable guides for getting . . .

Cost Comparisons You Can Trust

MUCH OF THE PAPERWORK machinery for promoting a plant modernization project today is unused, or inadequate, or outmoded. Result: The men who decide the fate of modernization proposals don't get the facts they need for comparing costs and appraising proposals.

Lacking these facts (and complaining that they don't get them), these decision-makers often make the wrong decision—maybe they dump the right proposal from several that are submitted, or choose the wrong one, or just buy a lemon.

Those are the unhappy conclusions of FACTORY's editors after a searching study of procedures in 54 plants. If these conclusions fit you—and if you want to improve the chances of putting your proposals across—you'll find help in FACTORY's new, original guide for accumulating facts for your proposal (facing page). And in our checklist for measuring the usefulness of your proposal (panel, right).

Shy on facts—Sure, forms now in use for controlling capital expenditures are a dime a dozen—one-page summaries, multi-page analyses, whatever you want. Yet management insists that these forms don't help project originators gather enough facts—or the right facts.

Tell this to a plant operating man, and chances are he'll say: "Management should take my word that this is a good deal." Or "I can't understand why topside won't approve that new machine purchase. It will pay for itself in two years." He doesn't realize he has failed to spell things out—and that this failure is the major roadblock to acceptance of his proposal by his colleagues and the very top brass.

Listen to what higher management echelons tell FACTORY:

From one company: "Our operating people usually don't give us a complete story. They clutch at the first thing that comes along. An XYZ salesman can astonish them with a saving that will pay off in 12 months. But maybe a 6-month payoff would be possible with another product."

Says another: "Our people—even those at management level—fail to give a basic analysis of dollar savings. They fail to document facts beyond 'how many pieces this machine will produce.' They ignore intangibles such as floor space, maintenance cost, new storage needs."

Turn the page

By C. G. WYDER, FACTORY

How to Quiz Yourself About Your Proposal

1. Can you simplify, eliminate, or combine the operation?
2. Will redesign of existing equipment give the same or nearly equal results?
3. Will partial renovation, complete overhaul, or rebuilding be as satisfactory?
4. Can old equipment be modernized by adding new attachments at cost lower than new set-up?
5. Can old equipment be operated more hours per day?
6. Will a new location make old equipment more productive?
7. Will better maintenance or preventive maintenance increase capacity or service life of old equipment?
8. Can changed layout of other equipment give similar benefits?
9. Will materials-handling equipment or other mechanical aids solve problem?
10. Will better machine loading or better scheduling help?
11. Have you taken every step to minimize equipment downtime?
12. Can the same product be made any other way?
13. How long will present product be in production?
14. Will a change in product design eliminate or simplify new requirements?
15. Will outside purchase of product be cheaper?
16. Will subcontracting new operation be cheaper?
17. Does sales outlook justify increased output for life of new equipment?
18. Has new equipment the capacity for projected maximum production?
19. Will top production rate of new equipment be limited on a "balanced line" by lower capacity of other equipment?
20. Will new equipment bottleneck subsequent operations?
21. Is new equipment adaptable to design or layout changes?
22. Does new equipment require new tool set-up or new maintenance skills?
23. Is a high-paid operator needed? Is maintenance limited to premium shifts?
24. What are chances of early obsolescence of new equipment?
25. Is any equipment available that's better than that proposed?

NEWS ABOUT MACHINE MOUNTS

"UNISORB LEVEL-RITES CUT MACHINE MOUNTING TIME BY 75%!"

SAYS DAKE CORPORATION

New Unisorb Level-Rite Mounts are providing vital money-saving benefits for plants. Dake Corporation — moving machine tools into their new Grand Haven, Michigan plant — found they saved approximately 75% in mounting time. Plus . . . machines have less vibration, are quieter, can be quickly and easily leveled at any time and are always ready for relocation.

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COST COMPARISONS

Begins on page 156

From a third: "We seldom get enough information beyond 'I need a new sheeting machine.' Our people fail to investigate necessity—don't tell us how long we'll need that sheeting machine. Maybe it's only a temporary need, and it would pay us to send the work out."

HOW FORMS FALL SHORT

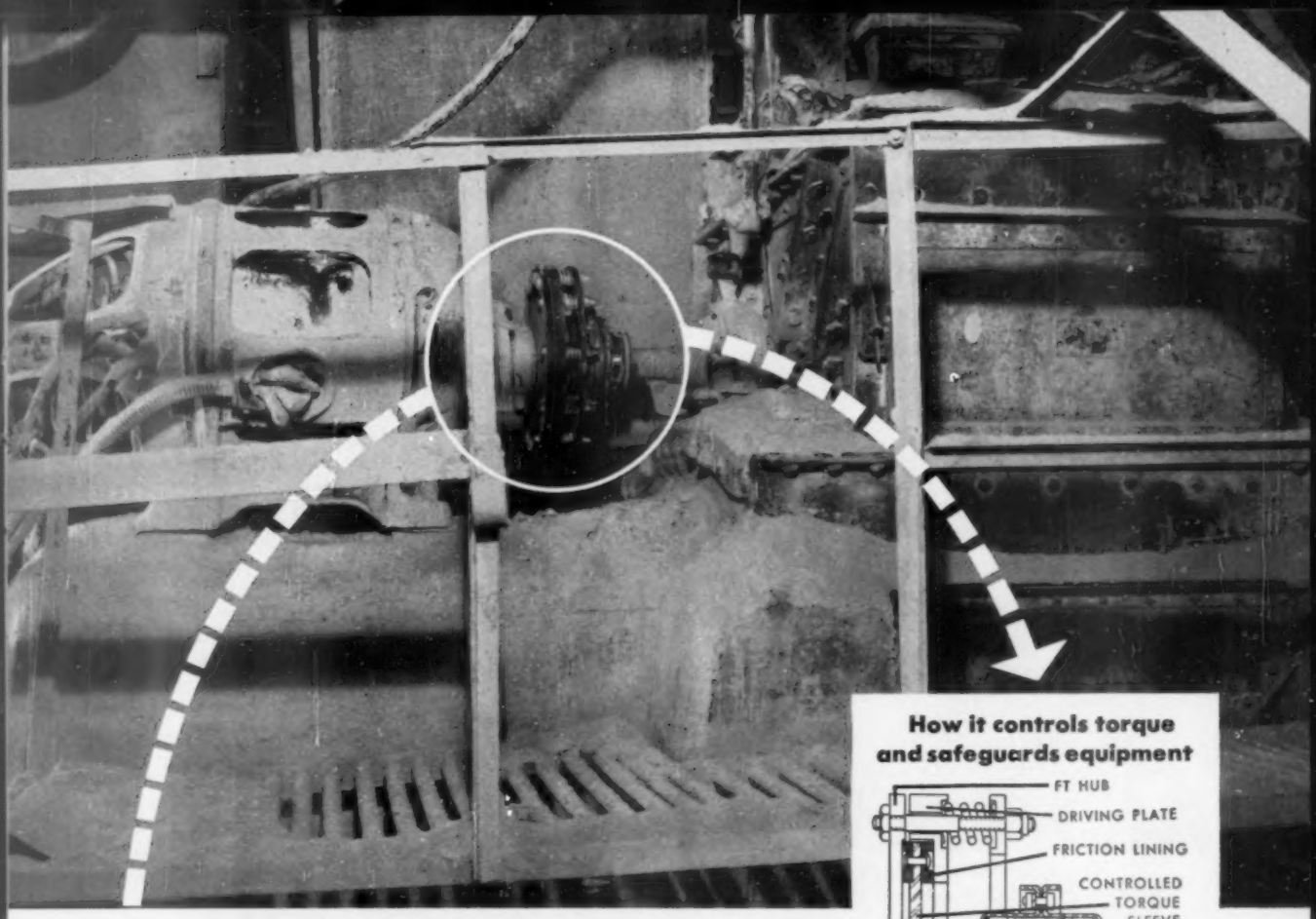
Why isn't management getting all the data it needs to make intelligent capital investment decisions?

In 33 of the 54 plants FACTORY editors visited, we found 26 using forms of one type or another—from simple one-pagers to complex five-pagers. One company has a 15-page assortment to handle minor to major projects. There's no general pattern in format, except among four companies that use the MAPI system (p. 94) and five that use some modification of that formula.

Study of all these forms reveals two main purposes: (1) accumulation of operating, financial, and technical data for justifying a capital expenditure (forms for this purpose are variously called cost or engineering estimate, worksheet, new project analysis sheet, re-equipment analysis) and (2) summary of project cost-and-investment details (forms for this purpose are variously called request for appropriation, authorization request, capital expenditure request, authority for expenditure—popularly known as AFE—and equipment replacement request. Most companies use at least the appropriation-type request form. Some use both. In some companies, one form fills both needs.

Seven of the 33 companies use no standard forms. Why? Sheer lack of interest, or lack of procedure sophistication, or outspoken disagreement with (or criticism of) standard forms. In one company a request for a $300,000 appropriation included a few pages of simple cost calculations for major items. (And top management actually approved half the items in this request on the basis of that skimpy information.)

"Yes" and "No" on MAPI—The Griffin Wheel Company (Chicago), after sending its men to courses on MAPI at Beloit College and Illinois



Protect machines from overload damage with FALK Controlled Torque Couplings

The above picture shows a Falk Controlled Torque Coupling connecting a 150 hp motor to a hammermill. Formerly, when tramp iron got into the mill, it was necessary to rewind the motor at least twice a year. But, in the 2½ years after installing a Falk Controlled Torque Coupling, no motor repairs were required. *That is real saving!*

Wherever overload danger exists, a Falk Controlled Torque Coupling gives positive protection against machinery damage from excessive torque or jams. This unique coupling has an adjustable friction slip clutch which can be set at *any* predetermined torque limit. Thus, transmission of dangerous shocks is prevented...overloads are limited...shaft breakage is eliminated.

Another big advantage is that, when the cause of the overload is removed, the entire coupling will rotate and transmit power without resetting, and *without replacing parts or repairing the coupling*....And, the Controlled Torque Coupling incorporates the famous Falk Steelflex torsional resilience to smother ordinary shock and vibration, plus the ability to accommodate shaft misalignment....Consult your Falk Representative or Authorized Falk Distributor. **Ask for Bulletin 4100.**

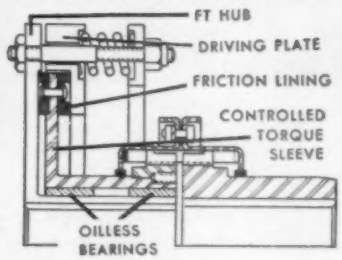
THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

Representatives and Distributors in many principal cities.

For more facts circle 534 on Reader Service Card

How it controls torque and safeguards equipment



Here (as in photo), the torque-control hub is shown mounted on driving shaft. From this hub, power is transmitted through friction lining to controlled torque sleeve. Load to be transmitted is determined by the (pre-set) pressure on friction lining. In case of overload, this hub still rotates until power is shut off—but the rest of the coupling and the driven machine will slow down or stop.

Motor Shut-off Control

By adding an automatic cut-out switch with V-belt connection to driven shaft, motor can be stopped immediately. With the standard hub mounted on driven shaft, the switch opens the electric circuit when speed of switch falls below predetermined value.

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MATHEWS
Over Fifty Years of Leadership in Mechanized Handling

COST COMPARISONS
Begins on page 156

Tech, sums up its feeling about MAPI: "The formula is too complicated, it's too easy for men to make mistakes. We don't want to tie up our organization with any straitjacket thinking. Labor costs are predominant in our analysis."

Another negative view on MAPI comes from W. H. Thompson v.-p. and general manager at the Riverside-Alloy Metal Division (N.J.) of H. K. Porter Company: "All I want to see are figures on direct labor and material savings, not including overhead—specific figures anyone can get. I've found there are so many items you can prove within two years that you don't have to use or develop a complex form." But Porter does have a "Capital Expenditure Request" for summary of data—that is its one and only form.

Other criticisms of MAPI and similar formulas are these: "The MAPI formula is too involved for us. A man had to write a book to explain it, and then another book to explain the first one. We'll stick to our one-page form. We worry about savings and cost reduction more than return on investment." Another: "MAPI is far too complicated. It requires judgment to reach a conclusion through the formula. So why not use judgment in the first place and forget the formula?"

Stacked against these adverse opinions are four plants that use MAPI, plus five others that use some modification. At Tapco Division of Thompson Products, Inc. (Cleveland), the sentiment is: "MAPI works good, like a formula should. It's as good as anything available." And Link-Belt (Chicago) chimes in with: "MAPI is the best thing we know of."

Biggest percentage of companies that use forms have designed their own. Significant point is that there's little resemblance among them. They vary from simplicity to complexity. And many lack clarity. Even so, over 75% of the plants FACTORY researched are using one or more forms for top management review of proposals for capital expenditures.

Facts the big need—Why, then, does top management complain so much about lack of critical facts? And why do project proposers com-

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Mackinac Bridge, world's longest suspension bridge, connects upper and lower peninsulas of Michigan. Because reliability of equipment is an important factor in the grouting operations, Gates Water and Air Hoses were used.
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TPA 304

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COST COMPARISONS

Begins on page 156

plain about lack of sympathy—and refusal to act on proposals. Do these forms somehow fail to bridge the gaps between management levels?

The fact that these complaints exist suggests there's something wrong. What? We studied the many forms in use for clues. What follows is a report on what companies are doing —and what this suggests for improvement in your own technique.

HOW FORMS FILL A NEED

Let's get this straight. Even if you formalize fact gathering you don't guarantee correct information. You don't really solve problems by forms. If management doesn't encourage modernization ideas, no form will pull them in. And if it doesn't beat the bushes for good ideas, even a perfect form won't make a poor idea look good.

But FACTORY's study shows that forms do have big advantages:

- They provide a route for transmitting ideas.
- They provide a uniform analysis technique for measuring and appraising an investment.
- They force scrutiny of important features, thus screen bad ideas.
- They minimize poor decisions based on inadequate data.
- They improve the chances that good ideas will get acceptance.

WHAT'S WRONG WITH FORMS

There are some organizational or proprietary forms in use, such as MAPI and NMTBA forms. Also the ASME form of early vintage. Their chief concern is economic analysis of a new project. They differ in philosophy and development of facts, yet each has disciples.

Examination of company-developed forms shows the same lack of uniformity. The more forms we studied, the more confusion we found—not in the forms themselves but in the differences among them.

Facts on forms—Out of this confusion these observations emerge:

- A single-page form usually covers only one problem—the economics of an existing versus a proposed facility. Some forms include data on major project specifications. Few

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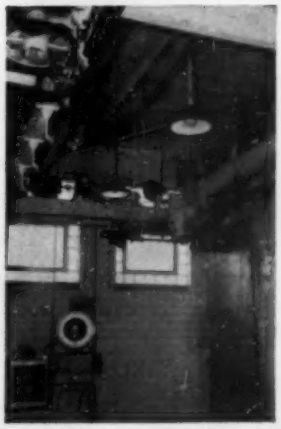
MULTI-SCAN FOR WEIGHING ITEMS IN MOTION



For items moving on overhead tracks (hog carcasses, for example) Toledo Multi-Scan system provides accurate average weights without necessity of bringing the swaying carcasses to rest. Weight data is fed into remotely located adding or other office machines for listing and totalizing of weights. Identifying data may also be introduced through key input stations.

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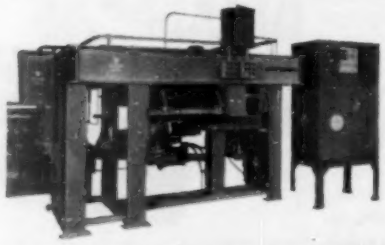

PRODUCT TESTING AND CLASSIFYING

This custom-engineered Toledo automatically tests and classifies large coil springs. It is one of many types of Toledos used for classifying a wide range of items — from small packages to large cartons and production parts — in a variety of manufacturing operations.

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When you have a problem in weighing, testing, counting, batching, sorting or weight data processing . . . and you want the practical, economical answer . . . it will pay you to check with Toledo. Toledo's complete line of industrial scales provides today's effective answer for a wide range of needs; or for special applications, Toledo Scale engineers will work with you on modifications or completely custom-engineered units. Toledo's huge reservoir of experience is your assurance of a practical, cost-saving solution. Let us help you. Write TOLEDO SCALE, Division of Toledo Scale Corporation, Toledo 12, Ohio.

TOLEDO® HEADQUARTERS FOR WEIGHING SYSTEMS

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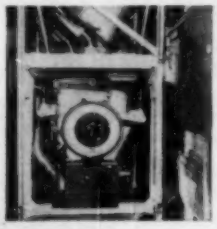

Toledos provide accurate, net weight listing and totals of bulk materials going into truck or carload shipments. Weighing is automatic. A Toledo weight-control console with automatic recording and totalizing unit may be remotely located for operating convenience.

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Rush catalog re Insul-8-Bar mobile electrification.

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COST COMPARISONS

Begins on page 156

of them analyze other important or intangible facts or conditions that could sway a decision.

- Most forms try to get too much information in one blow. Or they allow too little space for a detailed answer. For example, one company allows only half a line (and the back side of the page, if needed) to show how soon an installation will pay for itself.
- In many forms the intent is obscured by a miscellany of questions or data that aren't understood. Also plant operating men can't be expected to know some of the answers that call for accounting skills.
- A better analysis is possible where separate forms (or sections of a single form) are provided for economic facts, justification, operating data, financial analysis.
- Only about one-fifth of forms allow for data on non-productive or non-manufacturing facilities—materials handling equipment, air conditioning, or central lubrication.

Better forms needed—Following are our conclusions from the above:

- In selecting good investments management must think beyond economic evaluation. Important as cost data are, a good form should invite supporting data—physical, technical, and operating. These data will give the well-rounded picture top management now says it doesn't get.
- There's no magic formula (or form) that will guarantee good judgment and the right choice every time. But the greater the detail in the form, the better the analysis.
- There's need for standard-practice instructions on the why's and how's of filling in the form. When operating men have to answer questions they don't understand, it's small wonder their information doesn't make much sense. They don't want to look ignorant, so their answers are often vague.
- There may be a place for a simple "request" form that any management man (even a first-line foreman) can fill in. It would merely state an improvement idea for further study by specialists—say, plant or industrial engineer. Companies with work simplification programs often use this technique.

These conclusions don't mean

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This booklet is based on the premise that modernization can start anywhere in your plant. It can be a single machine or operation . . . a better way of getting variable speed . . . a faster way to braze . . . or a newly available replacement. In fact, this type of updating is far more common than the sweeping change.

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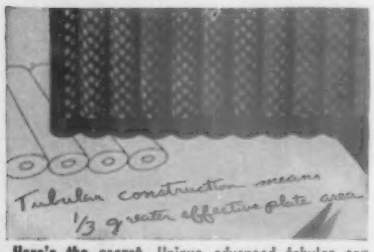

Here's the secret. Unique advanced tabular construction. Every positive plate packs more power. So you get greater battery efficiency—more power in the same size to fit your present trucks.

With the new Exide-Ironclad Batteries now available, your present trucks can work 25% to 56% longer than with batteries you have bought in the past. Now electric industrial trucks can do more work per shift, work longer, cost less than ever to own and operate. Only Exide batteries offer the twin advantages of more power and longer life. Find out just how much you can gain. Call your nearby Exide office. Or write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

you should get form-happy, but, rather, form-discriminating. Don't use an economic-justification form where it doesn't apply. But do use an operation-analysis sheet to insure consideration for all elements in a proposed change. At De Laval Separator Company (Poughkeepsie) such a two-page analysis is part of every modernization move.

So, what form to use? Instead, the question should be: What do you want the form to accomplish? The following questions will guide you to effective forms:

1. What do you need to keep your plant modern?
2. What will the project cost?
3. What reasons make it desirable or necessary?
4. Has everything been checked?
5. Is it a profitable investment?
6. Can you really afford to spend the money?

You'll find guides for your answers to Question 1 on p. 84 ("Obsolescence Audit Guide"); to Nos. 5 and 6 on p. 90 ("How to Figure Payoff"). Here, in the following pages, are guides for answers to Nos. 2, 3, and 4—plus our observations on company practices and the helps you can draw from them.

7 KEYS TO GOOD FORMS

Is there a basic form? A universal form? No. And we can't create one for you. But if you want to build your own, here are the major features of all forms we studied: Name of project, location, description, reason for expenditure, completion date, cost summary, estimated savings, and signatures.

With this outline as a starter you can move on to seven questions. Your answers will determine what kind of form you need for your plant.

1. One for every project?

Practices vary. They're influenced by the amount various levels of management may spend without higher approval. At American Smelting & Refining Company (Perth Amboy, N.J.) all capital investments over $2500 require an appropriation request for the president's okay. At Falk Corporation (Milwaukee) and Vapor Heating Corporation (Chi-

MAINTENANCE COSTS ARE LOWER, repainting jobs fewer and farther between—even in the most corrosive spots—when you use aluminum paint...especially paints made with Reynolds Aluminum Pigment fortified with Strontium Chromate.

Strontium Chromate gives aluminum paint added rust-and-corrosion-proofing power. It's an extra, built-in inhibitor that makes one-coat paint jobs last longer, reflect heat better, protect better.

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Coat Your Roof With Aluminum... For Lower Upkeep, Cooler Buildings

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Transite Pipe is strong, lightweight, easily handled . . . only larger diameters need handling equipment.

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When it comes to pressure pipe—you can pay more than you would for Transite®. Or you can pay less. But no other material gives you more than Transite in *economic life!* For Transite's every advantage—whether of price, installation or performance—contributes to maximum, long-term economy.

First, there's Transite's low cost. Then, there's its installation economy! Lightweight, easily handled, it needs fewer men to install it. Installation is made still faster, *surer* with Transite's Ring-Tite® Coupling that provides a tight, lasting seal.

Once in operation, savings continue. Transite's smooth interior stays smooth—keeps pumping costs low, assures full water flow for the life of the pipeline. Made of asbestos-cement, Transite keeps maintenance to the barest minimum . . . it can't rust, is highly resistant to both corrosion and electrolytic action. Write for Pressure Pipe folder TR-160. Ask too about Transite Pipe for other plant services. Write Johns-Manville, Box 14-FA, New York 16, N.Y.

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cago) sums over $100 need top executive approval. Miller Brewing Company (Milwaukee) sets limits at $1000 for division manager, $500 for plant engineer, and $100 for engineering office manager.

There's dual control at Motorola, Inc. (Chicago). Plant manager and industrial engineering manager may approve up to $200; works manager and plant manager up to $500, after which manufacturing vice president and treasurer must approve. Other companies show similar limits—the highest, $5000.

We don't know how many plants insist on formal authorization for every capital expenditure, however small. One plant does—for accounting reasons. Main policy point, we think, is whether such formalizing will encourage ideas—but screen out the bad ones.

Can a man slice a pet project into small pieces, thus sneak it past his approval limit? Not if this question is on the form: "Is this a partial project? If so, explain."

2. Who prepares the form?

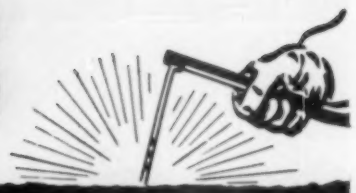
Also important: Does anybody help the man who prepares it? It's important because an unskilled person may not gather enough data. Thousands of dollars can go down the drain if projects are chosen without accurate documentation.

Should the job be delegated to a file clerk or a first-line foreman? George Terborg, author of the MAPI plan, says not. He recommends an equipment engineer who specializes in replacement studies.

FACTORY's study shows few companies let an amateur do this expert's job. In only three of the companies surveyed do line foremen or minor staff people prepare forms. At Paterson Parchment Paper Company (Bristol, Pa.) any supervisor can request an improvement, but plant engineering must fill out the appropriation request. In four plants industrial engineering gets the job; in three plants, the engineering department. Other plants use plant manager, manufacturing engineer, controller, finance manager, originating department head, maintenance engineer, plant engineer.

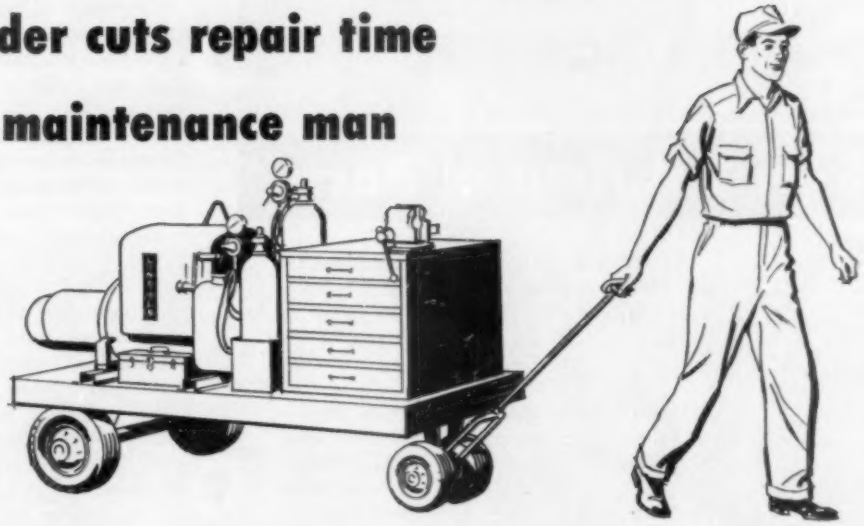
These people, as a rule, call on

Weldynamics



ARC WELDING AT WORK CUTTING COSTS

Portable power generator and welder cuts repair time for maintenance man



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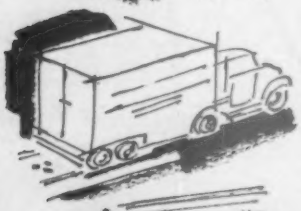


DELIVERIES ARE MADE ON TIME—Orders for the most frequently used types of wire cloth are promptly filled. If we can't supply what you want from our complete stock, we'll schedule our looms to get it to you as soon as possible.

INSTALLATIONS ARE CHECKED—At Cambridge, orders aren't filled and forgotten. Our own sales engineers follow up your order to make sure our product is giving you the best possible service.

QUALITY, OF COURSE—Individual loom operation and countless checks on mesh size and mesh count assure you of highest quality wire cloth when you specify Cambridge.

Let us quote on your bulk or fabricated wire cloth needs. Samples for inspection or test purposes are available upon request. Call your Cambridge FIELD ENGINEER. He's listed in the phone book under "Wire Cloth." Or, write direct for FREE 94-PAGE CATALOG and stock list giving full range of wire cloth available. Describes fabrication facilities and gives useful metallurgical data.

The Cambridge Wire Cloth Co.

WIRE CLOTH · METAL-MESH CONVEYOR BELTS · WIRE CLOTH FABRICATIONS

Department E, Cambridge 11, Maryland

OFFICES IN PRINCIPAL INDUSTRIAL CITIES

For more facts circle 546 on Reader Service Card

Begins on page 156

other departments for data and substantiation. Plant engineering at Paterson Parchment, for instance, gets data from cost department, manufacturing, research, and sales. Many companies require either accounting or the controller to certify data. And some feel like the New England conveyor manufacturer who said, "We don't let plant operating managers fool around with cost of money, taxes, and the like. That's for the controller."

Cost data, of course, must be reliable. In comparing operating costs a few poor estimates of contributing costs can make a doubtful project look rosy—or kill a good one—or call for a close decision. Adding estimates in the nearest $100 with accurate-to-the-penny figures often doesn't make sense. So there's merit in tagging totals with some index of accuracy—maybe an asterisk for every estimated figure, plus a parenthetical total of estimates after every comparative total. Nobody really expects decimal-point accuracy in such figures. There must be assumptions, estimates, forecasts. But a decision maker does have a right to know how solid is the basis for his judgment.

The source of operating data comes under the same scrutiny. Our study shows, for example, that maintenance costs influence equipment replacement decisions. Yet in our recent nation-wide survey (FACTORY, September 1958) only 44% of the companies reported that they develop costs on individual units or machines. And 36% do not tie such costs into accounting records.

Production performance and cost data are usually more reliable. But even here you must guard against figures that represent either best or worst performance.

3. Who signs the form?

Most plants demand plenty of high-caliber countersignatures to appropriation requests. Only a few are satisfied with two signatures.

Figures, of course, don't always tell the whole story. That's why, at Bell & Howell (Chicago), a detailed worksheet is approved by heads of production control, manufacturing

Turn to page 176

For more facts circle 547 on Reader Service Card ➤

SYLVANIA
INDUSTRIAL LIGHTING HELPS

Route to:
1. _____
2. _____
3. _____
4. _____
5. _____

Helpful data and suggestions on plant lighting—drawn from the Sylvania Fixture files for your use

No. 2 OF A SERIES

Previously outlined: Ways for management to make a quick appraisal of existing lighting. Now, for your use, a compact guide on . . .

How to Choose the Right Fluorescent Lighting System for Your Plant

Today, more and more management men recognize good plant lighting for what it is . . . a Production Tool that can be utilized and controlled effectively to increase plant output, reduce material rejects, save on tool breakage, increase personnel morale, and reduce absenteeism and costly employee turnover.

Case after case in the Sylvania files shows how a variety of savings and profits have been realized by various companies as a direct result of a new or improved lighting system using the proper Sylvania fixture (see box).

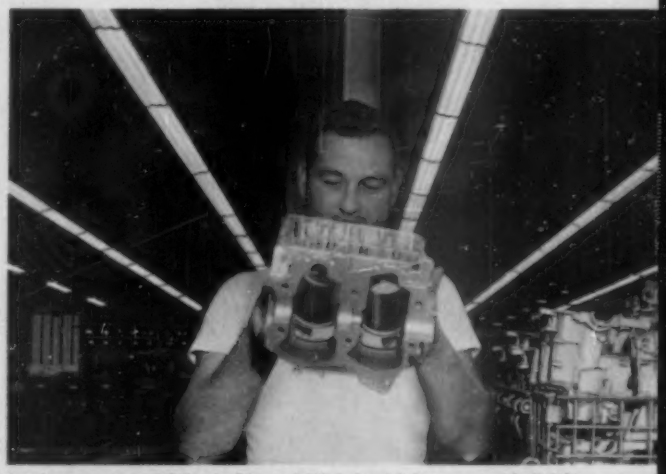
In the previous Sylvania Industrial Lighting Helps folder published several months ago, we outlined a simplified 10-point check list to show how you can measure the adequacy of your plant lighting. If, through the use of this check list or some other method, you have determined that your production efficiency can be improved with better lighting . . . what is your next step?

Obviously it is to determine and choose the type of lighting system that will best suit your plant and solve your problem . . . to pick the right production tool to provide you with the most benefits for the most reasonable cost. Just as you would not purchase a machine tool for its capacity alone, your lighting system too should be designed to suit *your* purpose, to meet *your* goals, to give *your* plant the lighting that will serve it best. (Incidentally, a Sylvania Fixture Specialist will be glad to help you design such a system, at no obligation.)

Because so much of the decision concerning your lighting will be determined by the physical layout of your plant and the work performed in it, we cannot give you a magic formula to provide you with the perfect illumination system. But we can help.

That is the purpose of this folder—to give you information and tips on factors that are common to all lighting problems—to equip you with data to make good judgments—to help you to communicate better with your electrical engineer, contractor or Sylvania Fixture Specialist.

LIGHTING FOR TOLERANCES OF .0003″



Continuous rows of Sylvania Diamond-"I" industrial fixtures provide lighting needed to maintain extremely tight tolerances on aluminum pistons and cylinder blocks (shown) at the Johnson Motors machine and die casting plant, Waukegan, Ill.

What type of light source?

When it comes to picking the source for your plant lighting, you can choose from 3 types: fluorescent, incandescent, or mercury vapor. Fluorescent is used for general lighting in well over 90% of industrial applications because it is the most efficient, practical and economical. Incandescent and mercury vapor can be used to advantage in special applications or as part of an overall lighting system. Because of space limitations, this folder is limited to fluorescent systems.

On the other pages of this folder we go into several details about fluorescent lighting systems. We think you'll find it helpful.

TO OUR READERS

The previous Sylvania folder, Industrial Lighting Helps No. 1, shows how plant lighting has definite effects on production rates, quality control, other vital cost factors. Before-and-after case history data prove that savings and profits result when lighting is considered and treated as a production tool.

Also shown is a simple, valuable step-by-step method of evaluating your plant's present lighting system and for comparing it with present-day standards.

To receive a copy of the previous folder, simply check the first box on the postage-paid reply card on Page 4 of this folder, fill in name and address, and mail.

Points to be considered when planning a lighting installation

Physical layout of the plant, and type of work to be done, are 2 of the most important considerations in planning a lighting job. However, these vary too greatly from one installation to the next to be discussed here. Instead, we will concentrate on the other factors.

Quantity and quality of light

Any good installation should provide both sufficient quantity and good quality of illumination.

Quantity refers to the amount of light available on the working surface. Needed quantity depends first on type of work being done, also on other factors such as workers' ages, whether task is continual or intermittent, etc. The amount of light can be increased by adding more fixtures, or fixtures with more lamps or higher intensity lamps.

Recently the Illuminating Engineering Society published the findings of an 8-year research study it had sponsored to determine scientifically the quantities of light needed for various seeing tasks. These show requirements ranging all the way from 10 to 1,000 footcandles. The table on Page 4 lists typical requirements.

Quality of illumination cannot be defined or measured so easily. Good quality lighting results primarily from following a set of "do and don't" rules; it depends as much on the surrounding area as on the light source itself. Here are some of the factors which must be taken into consideration for *quality* lighting:

Brightness Contrast—Refers to the brightness relationships of elements within the area of vision. Because the eyes "take in" far more than the actual work, and eye discomfort results when contrasts within the field of view are too great, every effort should be made to keep contrasts to a minimum. Proper fixtures properly located can overcome this problem.

Surface Reflectances—To create a better working environment and to insure better brightness balance, the finish on the room surfaces—especially walls and ceiling—should have a high diffused reflectance consistent with the work being performed and the surrounding area.

Glare—Both direct and reflected glare should be minimized because of their great distracting quality. Direct glare occurs when an area in the field of vision is uncomfortably brighter than the visual task. Reflected glare is the result of light reflected by a polished surface into the eyes. Proper orientation of fixtures or shiny surfaces can often reduce glare. When the reflected glare is caused by the object on which the work is being performed, the right quality fixture, properly oriented, can help overcome the problem.

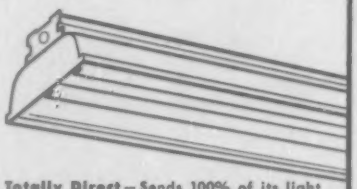
Shadows—Unwanted shadows can make seeing uncertain and can constitute a safety hazard. Quality lighting minimizes shadows by providing proper light diffusion.

How much "Up" light do you need?

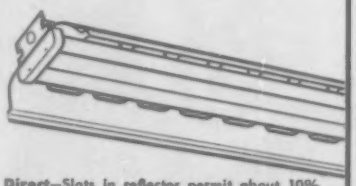
When you reach the point of choosing the type of fluorescent fixture to use, you have a wide range to pick from. For instance, Sylvania offers over 25 different fixture "types," each with its own particular advantages and application. Here's where your Sylvania Fixture Specialist can be helpful . . . for it is his job to know the advantages of each type of Sylvania fixture and how to apply it.

In the selection of basic fixture type, the application again plays a big role. If your operation is semi-industrial in nature, or highly critical, and problems of dirt can be controlled, you might safely consider one of Sylvania's 2 large-area lighting systems, or the type of fixtures usually associated with office installation.

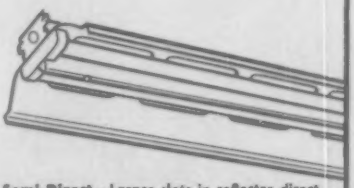
But in most instances, dirt and maintenance must be considered, limiting you to 4 basic fixture types:



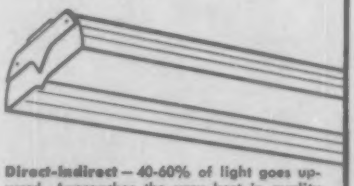
Totally Direct—Sends 100% of its light downward. Excellent for directing light on work as supplementary lighting. Not recommended for general lighting.



Direct—Slots in reflector permit about 10% of light to go upward, illuminating ceiling areas, reducing uncomfortable brightness contrasts and shadows. Permit escape of "trapped" heat, aiding effective lamp operation.



Semi-Direct—Larger slots in reflector direct 25-30% of light upward. Air flow through slots carries off dust, simplifies maintenance. Use when ceiling is light and clean. Reflected light from ceiling blends with direct downward light for balanced brightness.



Direct-Indirect—40-60% of light goes upward. Approaches the very best in quality lighting for critical seeing. Especially applicable in dirt-free, easy-maintenance areas.

To learn more about these lighting elements as well as the benefits of color consideration, aesthetics, psychological effects and correct choice of fluorescent lamps, send the reply card on Page 4 of this folder for Sylvania's 28-page booklet, "Prescribed Lighting Protects the Eyes of Industry."

Quality of fixtures

When discussing quality of light, we noted it was an "unmeasurable" factor. The same can be said of the quality of fluorescent lighting fixtures. Although you cannot measure the *percentage* or *degree* of quality of a fixture, there are certain standards which serve as a good guide.

A good rule to follow is to discuss your lighting problems with Sylvania who, over the years, has built and maintained a reputation for making only quality equipment. Sylvania's Fixture Specialists, with a wide and complete range of fixture types to call upon and apply, can study your problem and recommend the fluorescent system that will serve you best. You'll be much safer and better satisfied this way than by purchasing an "off" brand of doubtful quality.

Another safeguard to insure your getting quality equipment is to specify that the fixture bears an RLM label. The RLM Institute, an association of manufacturers of industrial equipment, sets and checks minimum standards of lighting performance and equipment quality for a variety of types of industrial lighting fixtures. These include specifications for the type of metal, finish, lampholders, ballasts and other material used. All fixtures bearing the RLM label must continually meet these requirements.

From the lighting standpoint, all fixtures must meet established rules of efficiency, distribution and other performance standards. Remember, however, that RLM sets *minimum* standards. Every Sylvania fixture that bears the RLM label exceeds the RLM specifications in all categories where it is possible to do so. Many other quality features are also built into all Sylvania fixtures.

★★★★★★★★★★★★★★★★★★★★

Today's standards of quality in lighting commercial interiors are frequently higher than in industrial interiors. We at Sylvania consider this a wrong emphasis—for many industrial seeing tasks are "tougher" than commercial tasks, may involve far greater potentials for errors and spoilage which can't be corrected, may even involve a higher average of employee skill and eyesight dependence. That's why, in the Sylvania Catalog, we recommend many "commercial" fixtures for those industrial applications where quality lighting is a key goal.

Methods of controlling plant lighting

How do you keep brightness contrast, glare and shadows under control? Let's look at the basic methods.

Mounting Height. Physical layout and plant dimensions have a lot to do with ideal mounting height. But for good light distribution and reduction of direct glare, best practice is to mount fixtures as high as you can with consideration of overall appearance and maintenance.

Low Mounting. Only 3 out of 9 fixtures contribute light to work surface at "x."

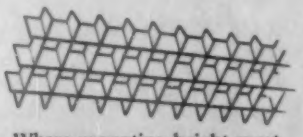
High Mounting. Here, 7 out of 9 fixtures contribute light to the work surface.

Individual Mounting vs. Continuous Rows. Continuous-row mounting is recommended as the most all-around practical where desired lighting level is 50 footcandles or more. This gives better light distribution, improves appearance, and normally saves on wiring and installation costs.

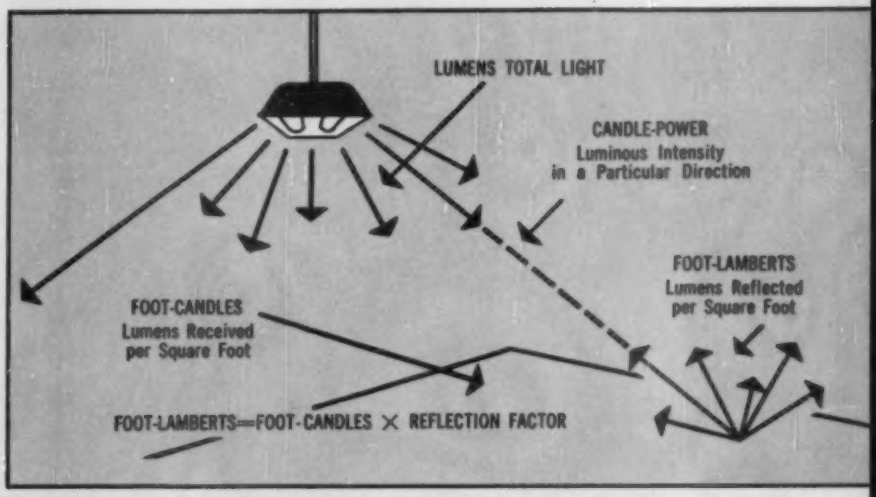
Fixture Spacing. Spacing of fixture rows to attain uniformity of lighting depends on footcandle level desired and fixture mounting height. For even distribution of light over an entire area, follow the rule of thumb that spacing between rows (or individual fixtures) should not exceed mounting height. For assistance on those occasions where large machines or operations call for nonuniform lighting pattern, talk to your Sylvania Fixture Specialist.

For mounting heights above 15 feet, investigate the many advantages of Sylvania fixtures which use the new, very high output lamps. These have 2 to 2½ times the light output of standard fluorescent lamps . . . permit big savings.

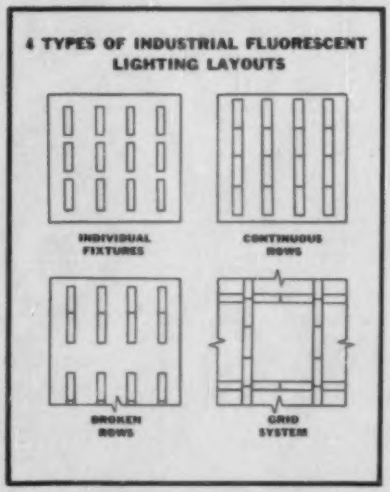
Fixture Reflectors. Shielding given by the fixture reflectors protects eyes from direct lamp glare—if fixture rows run perpendicular to worker's field of vision.



Shielding. Where mounting height must be low, or where critical work is being performed, additional shielding such as metal louvers is recommended. Louvers increase the quality of the lighting by reducing the possibilities of direct glare.



Brightness is the amount of light the eye actually *sees*—or the light *reflected to it*. This diagram shows how *foot-lamberts* (which measure brightness) are related to *lumens* (the total light output) and to *footcandles* (lumens received per square foot of lighted surface).



"Up" Light. As mentioned previously, slotted fixtures with upward components of light are recommended to minimize shadows and provide better light diffusion.

★

Supplementary Lighting. Where type of work calls for exceptionally high lighting levels, supplementary lighting fixtures, in addition to general lighting, are warranted. Here, too, quality is important.

★

Methods Other Than the Fixture Itself. To help maintain peak lighting efficiency and provide maximum diffusion of light, lighter colors should be used for better reflectance on walls and ceilings. Shiny surfaces should be so oriented as to avoid reflected glare.

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BUSINESS REPLY CARD
(First Class Permit No. 20, Salem, Mass.)

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division—Fixtures
One 48th Street
Wheeling, W. Va.

Many factors govern plant lighting costs

Supplementary fluorescent lighting, raising footcandle level at precision-work areas, aids in speed and accuracy . . . makes prolonged tasks easier on the worker . . . reduces numbers of rejects. Occasionally, fixtures are covered with diffuse plastic to reduce reflected glare from bright parts.

New recommended values of illumination for industrial tasks*

To illustrate the wide range of footcandle levels now recommended for industrial applications, we have listed below some of the levels recommended for seeing tasks common to many industrial plants.

MACHINE SHOPS	
Rough bench and machine work	50
Medium bench and machine work, ordinary automatic machines, rough grinding, medium buffing and polishing	100
Fine bench and machine work, fine automatic machines, medium grinding, fine buffing and polishing	500
Extra fine bench and machine work, grinding—fine work	1000
SHEET METAL WORKS	
Miscellaneous machines, ordinary bench work	50
Presses, shears, stamps, spinning, medium bench work	50
Punches	50
Tin plate inspection, galvanized	200
Scribing	200
WELDING	
General illumination	50
Precision manual arc welding	1000
WOODWORKING	
Rough sawing and bench work	30
Sizing, planing, rough sanding, medium machine and bench work, gluing, veneering, cooperage	50
Fine bench and machine work, fine sanding and finishing	100
MATERIALS HANDLING	
Wrapping, packing, labeling	50
Picking stock, classifying	30
Loading, trucking	20
Inside truck bodies and freight cars	10
STORAGE ROOMS	
Inactive	10
Active	
Rough, bulky	10
Medium	20
Fine	50
INSPECTION	
Ordinary	50
Difficult	100
Highly difficult	200
Very difficult	500
Most difficult	1000

*As recommended by the Illuminating Engineering Society. These levels are higher than those shown in the previous Sylvania Lighting Helps folder because the new figures were released after the other folder was published.

Note: For complete listing of industrial tasks and areas, see official publication of *Illuminating Engineering Society.*

To estimate the *true cost* of your lighting system you should include 4 basic factors:

1. Initial Fixture Cost—Includes the original cost of new lamps, too. Keep in mind that the quality of the lighting fixtures you choose will affect the life of your lighting system in addition to having a direct bearing on the other cost factors.

2. Installation Cost—Includes labor and wiring materials. The quality of the fixture you choose enters the picture here. Quality fixtures like those of Sylvania hold your installation costs to a minimum by providing more pre-assembly before the fixture leaves our plant, fewer parts to put together on the job, simple and secure fastening arrangements, and well designed accessories for joining and mounting.

3. Maintenance Costs—Includes, primarily, cost of lamp replacement and cleaning of equipment. Quality fixtures such as Sylvania's are designed for ease of maintenance including full accessibility of electrical components. Planned periodic maintenance for your lighting system is essential to keep your lighting system in top-notch condition. Planned group-lamp replacement, as compared with one-at-a-time replacement, will save you many dollars over a year's time.

4. Operating Costs—Figured on an annual basis, this includes power consumed, yearly amortization, interest on your investment, taxes, insurance, etc., usually carried over a period of several years.

When you view the complete cost picture as outlined above, you can see that top-quality fixtures actually save money in the long run and make a much better investment than inferior equipment.

To get detailed information and assistance . . . use this convenient reply card

Sylvania Electric Products Inc.
Dept. 300, Lighting Division—Fixtures
One 48th Street, Wheeling, W. Va.

Gentlemen: I need further information, but I don't want to be obligated in any way. Please, at no cost . . .

- ☐ Send me a copy of the previous issue of "Industrial Lighting Helps" on evaluating my present lighting.
- ☐ Send your complete 28-page booklet, "Prescribed Lighting Protects the Eyes of Industry."
- ☐ Send a copy of the Sylvania Fixtures Catalog.
- ☐ Have a Sylvania Fixture Specialist call.

Name_____

Position_____

Firm_____

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Best fixture value in every price range

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SLOW LEAK IN YOUR BUDGET?

Halt it with new "Rippletex" C-fold towels

Money dribbling away because your paper towels aren't earning their keep? With the new "Rippletex" C-fold towel now available in the famous Nibroc® line, you can switch to Nibroc and save money. Nibroc's perfect balance of absorbency, strength, softness, reduces waste—cuts cost-per-user—brings sharp savings in annual towel costs. Nibroc "Rippletex" C-fold towels in brilliant "White Magic" white are embossed for increased softness, greater bulk—better absorbency. They fit *any* C-fold cabinet. Mail the coupon today for samples and name of nearest distributor.

Brown Company
150 Causeway St., Boston 14, Mass.

Please send me samples and complete information on Nibroc "Rippletex" C-fold towels.

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COMPANY_____

CITY_____ STATE_____

BROWN COMPANY

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Mills: Berlin and Gorham, New Hampshire

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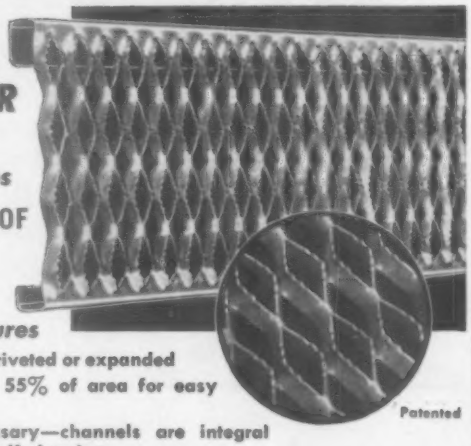
FOR MAXIMUM SAFETY ALL OVER YOUR PLANT

Important Safety Features

★ FIRE PROOF ★ SLIP PROOF
★ MAXIMUM STRENGTH
★ MINIMUM WEIGHT



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Important Economy Features

★ All one piece, not welded, riveted or expanded
★ Open space in excess of 55% of area for easy access of light and air
★ No extra supports necessary—channels are integral part of the material. ★ Self cleaning
★ Cut and installed like lumber by your own maintenance force. ★ Low in original cost. ★ For balconies, no secondary sprinkler heads needed

Ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads.

2 GOLD NUGGET® WELDED grating PAT. PENDING

The QUALITY GRATING for Heavy Duty Applications

★ 3/16" projection weld nugget for greater rigidity and strength
★ Vertical alignment of the main load bar assured
★ All bars are load carrying bars including secondary bars
★ Anti-skid pattern

PROJECTION WELD

Each secondary load bar (A), as projected welded to the primary load bar (B) has a shear strength of 5,000 pounds per weld. There are 28 such projection welds to a square foot of grating. This means that GOLD NUGGET Welded Grating can sustain greater shock loads than other gratings.

For the complete details of these revolutionary new gratings, write for new catalogs today. Distributors in all principal cities. Consult the yellow pages in your phone book under "GRATING".

108

PRODUCTS DIVISION
The GLOBE Company MANUFACTURERS SINCE 1914
4014 SOUTH PRINCETON AVENUE • CHICAGO 9, ILLINOIS

Begins on page 156

engineering, quality control, and plant engineering. General Aniline & Film Corporation (Linden, N.J.) has spaces for eight executive approvals before the AFE reaches the appropriations committee, president, and board of directors. A New Jersey company gets an okay from its managers of engineering, manufacturing, marketing, and employee relations, plus department general manager and division manager.

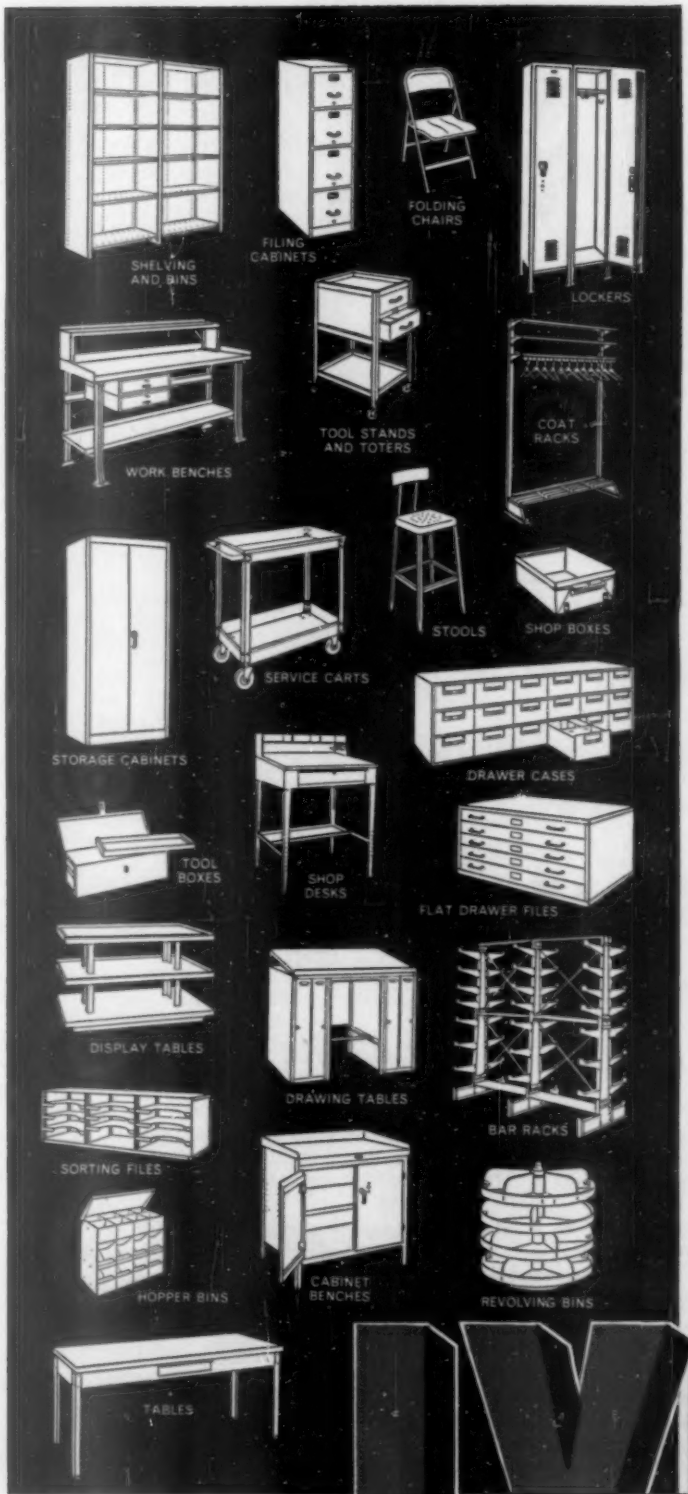
A top example of spreading responsibility for accuracy of data is found at The Louis Allis Company (Milwaukee). After a five-page "Request for Appropriation" is prepared by the controller, engineering, finance, manufacturing, and sales, a plant project engineer circulates it to 10 functional heads. Each of these men must attest to a prepared statement covering all his responsibilities. For example, the chief engineer signs this one: "I am satisfied that (a) in the area where the equipment is to be operated there are already, or provisions have been made for, sufficient electric power, gas, or other necessary utilities and foundations, (b) the maintenance of the equipment will not be unduly costly. We presently do/do not stock spare parts for this equipment."

4. Is money everything?

Management wants to know: "Should we spend the money?" Yet fewer than half of the forms FACTORY studied showed headings like "Reason for expenditure," "Justification," or "Purpose." Forms without such headings rely chiefly on economic comparison for justification.

In a few forms a checkmark against "Desirable" or "Necessary" tips off the reviewer to be careful about rejection. Most forms that request operating data are designed for production or manufacturing equipment and boil down to economic analysis. (Such equipment is easier to justify.) Among the chief reasons stated are tangible savings or improvements in quality, labor cost, downtime cost, maintenance cost, machine output, and operating efficiency. Obsolescence, strangely, takes a back seat.

But the dollar doesn't always gov-



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Lyon also has complete facilities for manufacturing special items to your specifications

NOW... OFFICE DESKS!

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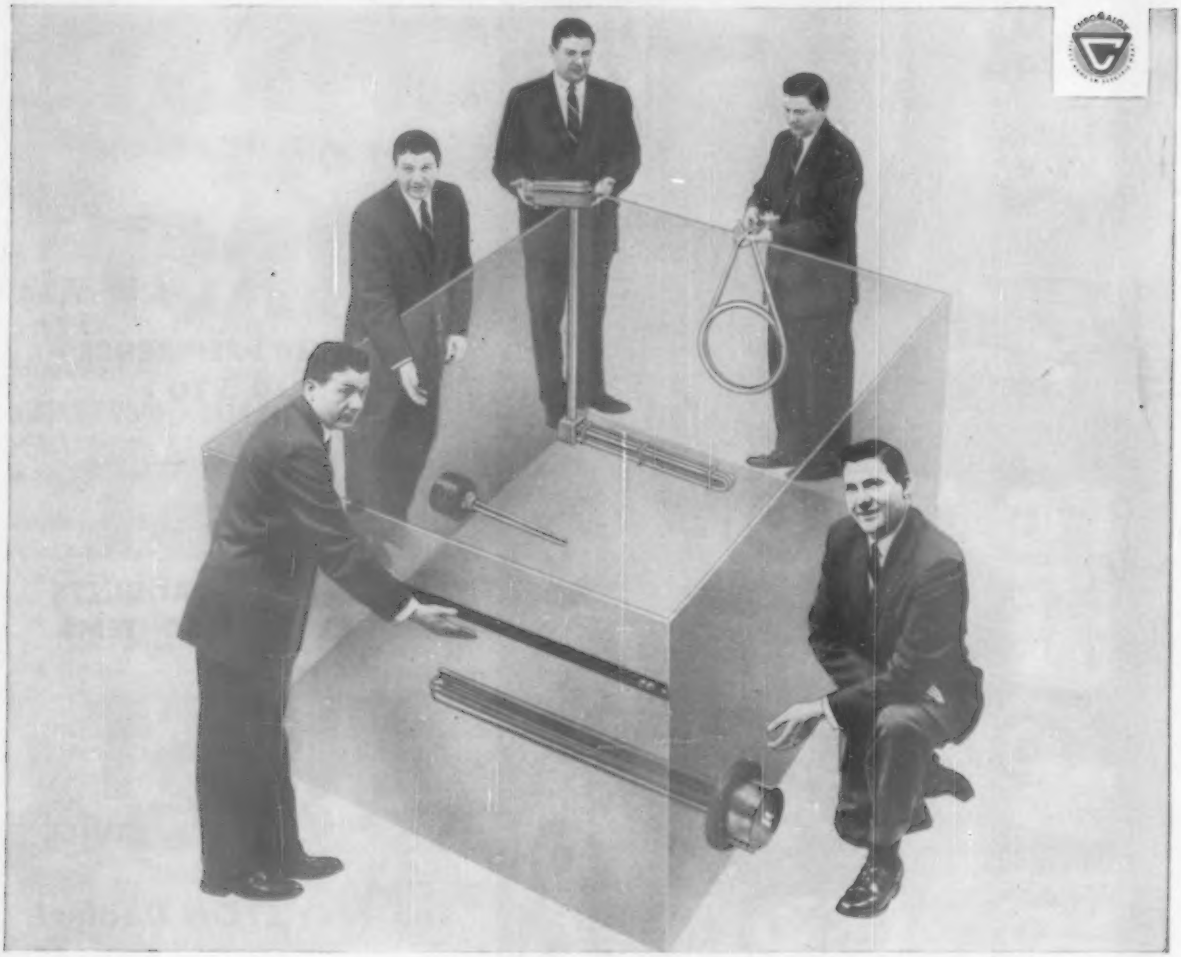
STEEL EQUIPMENT

For more facts circle 550 on Reader Service Card

What's the best way to heat a tank?



Your Chromalox man has the **ANSWER**

Trying to heat a tank with steam or combustible fuels often presents rough problems, costs needless time and money and leads to ineffective results. But 97 times out of 100 there is a quick and effective electric answer—and your "CHROMALOX man with the answers" has it. Here, for example, are five ways of heating a tank—each presenting significant advantages, and using stock industrial heaters in most instances.

- In the foreground, CHROMALOX Strip Heaters are clamped to the tank wall, heating by conduction, without contacting the tank contents. Tank interiors have full work space—cleaning is simplified.
- Moving clockwise: CHROMALOX Screw-Plug-Immersion Heaters, with standard pipe threads, go to work quickly in heating water and corrosive solutions. Heavy-duty elements of steel, copper, stainless steel, or alloy, all in correct watt density, have proper chemical characteristics.
- Next: Portable Tank Immersion Heaters require no tank openings. They put the heat down to the very bottom of the tank—and they are constructed for trouble-free life with moisture, heat, and acid-resistant parts and joints.
- Next: Coiled over-the-side heaters, for full but shallow tanks, produce good circulation and uniform temperatures. Various sheaths resist practically all chemicals.
- Next, at right front: a High-capacity Flange-Type Heater packs many kilowatts in a small space, particularly in water solutions. The heavy-duty flange simplifies installation.

So what's YOUR heating problem? Just call your CHROMALOX representative, listed opposite. He has the fast, clean, safe, accurate, economical ELECTRICAL ANSWER, backed by the world's largest stock of industrial electric heaters for immediate shipment, plus factory design engineering services.

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COST COMPARISONS
Begins on page 156

ern. Says one company: "We buy equipment at no apparent saving just to improve quality." In contrast: "We remove an obsolete machine only when it interferes with production." And for a narrow view: "Direct labor is our primary consideration." At times the following intangibles become the No. 1 reason: better customer relations, competitive position, ability to stay in profitable lines, market potential.

For justifying non-manufacturing equipment higher management gives some strong reasons that, with one exception, don't bear a dollar tag: employee well-being (health, safety, sanitation), comfort (working conditions, fatigue), and attitudes (turnover, morale); community relations (best workers attracted); necessary projects (emergencies, government or local codes). The one exception: lower building operating costs.

Companies almost unanimously favor safety expenditures. Says one: "We junked a new machine that proved unsafe shortly after we bought it." Another: "I've never seen a valid safety project turned down."

5. What data needed?

This is the crux of top management criticism—insufficient data for analysis and appraisal. The real fault, as we see it: Most forms don't delineate what's needed. They ask for "New equipment cost," "Maintenance cost," or "Fringe labor cost," then for supporting calculations. Thereafter the originator must scratch for himself.

True, some companies decide on the merits of a "desirable" modernization project strictly on the basis of direct labor and material figures. Others ask for more details. The fact that some companies ask for data that others ignore raises this question: Is top management really getting all the data it needs? And are these facts correct? We think not, because elements are often missing or unclear.

Perhaps the solution is a standard guide that a plant operating man can use to prepare comparison data or operating statistics. At Tapco Division, for example, the exact

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Marks **BIG** and **BOLD** on *any* surface! Especially designed for heavy duty use at your Shipping Room Table – Factory Bench.

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- **Transparent** marking inks, *all colors*
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Circle 552 on Reader Service Card

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MAKE	NORGREN	A	B	C	D	E
LOOSE PARTS TO DISASSEMBLE	4	9	16	13	6	12
TOOLS REQUIRED FOR MAINTENANCE	NONE	Wrench	Wrench & Screwdriver	Screwdriver	Wrench	Wrench & Pliers
TOOL OPERATIONS REQUIRED	NONE	2	10	16	2	4

If it's Norgren... It's Dependable.

For complete information call your nearby Norgren Representative—or write for descriptive literature.

C. A. NORGREN CO.

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Begins on page 156

meanings of terms and the sources of data are spelled out in a helpful 20-page cost study. It contains three pages of definitions alone, covering one section on operational cost analysis.

Who can prepare such a guide? We suggest an all-embracing committee of middle and higher management: administration, production, inspection, quality control, plant engineering, maintenance, industrial engineering, industrial relations, accounting—and perhaps design, shipping, and related functions. Object: to devise an analytical study that will include all factors for review of any project.

The same guide will not fit all industries or projects. We suggest a format of three parts: general instructions, specific guide points, and special cautions.

Since nothing speaks better than a sample, we have constructed the elements of a typical guide (p. 156). We derived it from analysis of all form data at hand, plus outside comment. We make no claim for its completeness or cohesiveness. So it would be a mistake to adopt it as it stands. You should remove items inappropriate to your operations and add the necessary elements. The guide points are purposely skeletonized. They should spell out the data wanted.

Why not build up a manual—an accumulation of all key points to be reviewed in the cost analysis of all types of equipment in your plant? No one form can cover the waterfront. But a manual has the weight of a universal form. Plus the advantage that you can choose the factors appropriate to a single project.

Let's come back to the need for effective data presentation. Near the start a good form should state the type of expenditure proposed (new project, improvement, repair, alteration). Such foreknowledge conditions the reviewer's appraisal of the facts and fixes the basis of his judgment. It also influences the method of presenting operating costs and tells whether you need a comparison of alternatives.

At Riverside Alloy Metal Division, for example, each "Expenditure Request" requires supporting

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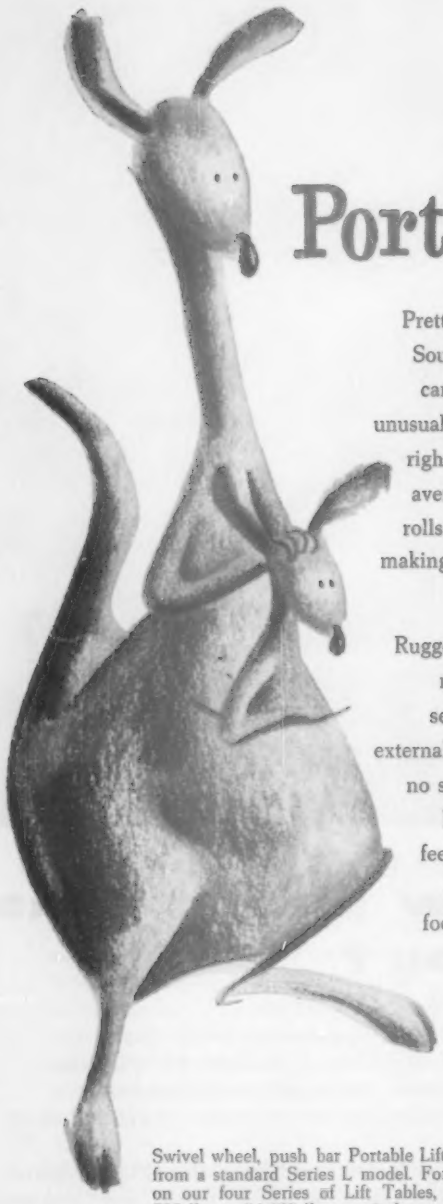

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Pretty handy . . . the way this special Southworth Portable Lift Table* can carry a load around. Because of its unusually low collapsed height, it slides right under standard skids . . . makes average loads completely mobile . . . rolls easily from location to location, making light work of feeding, handling and work-positioning problems.

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Swivel wheel, push bar Portable Lift Table, adapted from a standard Series L model. For further details on our four Series of Lift Tables, capacities from 500 lbs. to 24,000 lbs.; vertical travel to 64", write:

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COST COMPARISONS

Begins on page 156

data that show present operation, new operation, and three vendor bids. Motorola's top management likes to see that full study has gone into all alternatives. Most successful presentations, says Motorola's chief plant engineer, show at least two ways of reaching the goal. General Aniline & Film points out the value of summing up what it calls "incremental savings" that may be hidden in intangibles. "We admit you can't count a saving of half a man's time," it says, "but when you pull all such little increments together you may make a case."

How do you compare operating savings on modernization of buildings and facilities? Sometimes by simple arithmetic, says an aircraft company that just bought a new 20-year roof. Why? Annual cost of maintaining the old roof exceeded the cost of the new divided by 20.

There are other ways to justify non-manufacturing items. Many a company has moved from an old multi-story plant into a new one-level plant just for savings in materials handling. The cue is to relate the improvement to tangible manufacturing or labor savings. Opportunities are legion: a new floor means elimination of spillage and costly accidents; a relayout, saving in man-hours; a new storeroom, less mechanics' waiting time; a new exhaust system, less spoilage. And often the fact that "B Company saved X dollars with this machine" will be all the certification you need to put the idea across.

Of course, management prefers dollar justification for any new project. The initial test of acceptability is usually a computation of payoff—the relation of savings to investment cost. Thus three summary cost figures are critical in this initial test: operating costs of the old plans and of the new plans (to derive differential savings) and cost of new equipment (including disposition of old). Unless each of these summaries is reasonably correct, you'll get a false comparison. A manual with a guide similar to that on page 156 may be your way to flush out hidden costs.

The trial payoff comparison should not be the sole decisive factor. The effects of taxes, interest, de-

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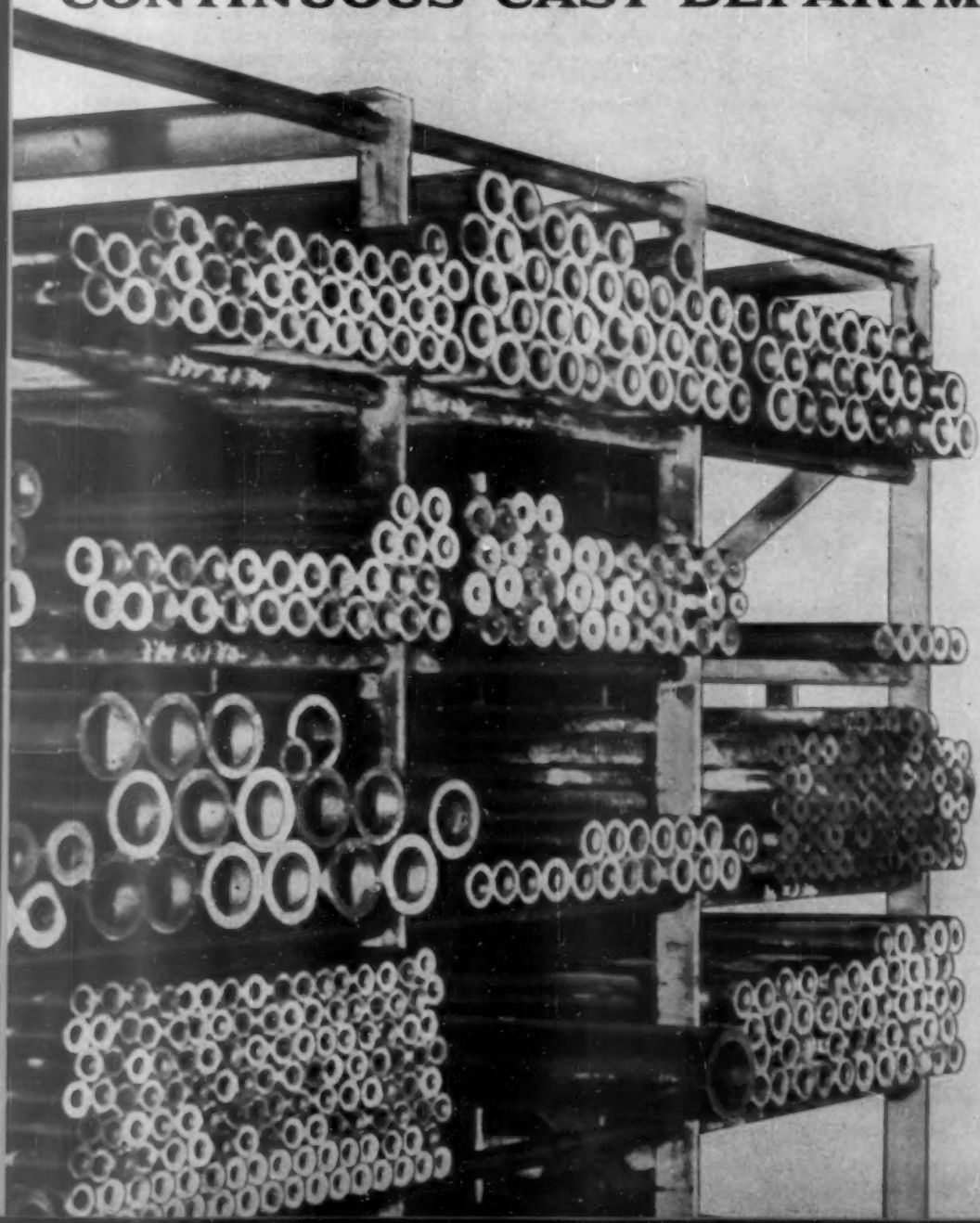
Positive way to cut maintenance costs: Asarcon 773 continuous-cast bearing bronze. Asarcon 773 (SAE 660) in *exact lengths* you need. No more short-end scrap as from 13″ bars. No blow-holes, pits, shrinks. No hard or soft spots. *No sand to dull tools.* Yield, impact, and fatigue strength as much as twice that of same alloys cast by other methods. Result: *less down-time.* Order Asarcon 773 from stock in 260 sizes, solids and tubes, any length up to 105″, from a national network of distributors. Write for address of nearest stock point and complete data, to Continuous-Cast Products Department, American Smelting and Refining Company, Barber, N. J. West Coast agent: Kingwell Bros., Ltd., 457 Minna St., San Francisco. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

58-19

CONTINUOUS-CAST DEPARTMENT OF



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COST COMPARISONS

Begins on page 156

preciation, and so on are also important (pp. 98-99). But unless the basic figures of project cost are completely developed, you'll compound the error of omitting costs in any final cost-and-savings computation. That's when you might kill your golden opportunity. Or wonder later why you laid an egg.

6. Will the data stick?

One good way to minimize fatalities among your proposals: Give them the acid test yourself.

To get objective analysis a few companies tie in all projects with methods improvements or work simplification. De Laval Separator includes an open-end "Operation Analysis Sheet" in all proposals for a manufacturing change—a list of 27 questions that check validity and inclusiveness of changes in any production operation. Half of Bell & Howell's equipment replacement worksheet is devoted to a "Capital Equipment Checklist." Great Lakes Carbon Corporation (New York) uses a 30-question checklist. It checks effect of proposal from raw material to end product.

Because this technique can be effective (but is little recognized) FACTORY has prepared a suggestive checklist (p. 157). Like the sample guide (p. 156), it's only a model. It's production-oriented, but there's no reason why similar checklists won't work for non-manufacturing facilities.

7. How to present data?

The simpler, the better. Here are some quick quotes:

"My management checks supporting details. The board rarely looks at them. But they've got to be available if questions are asked"—Project engineer.

"Management objects to reading lengthy reports. They must be to the point"—Plant engineer.

"We use a standard cover sheet with various attachments. In big projects some attachments are long, others short. Some use plot plans, others different exhibits"—Facilities planning engineer.

"Projects taking hundreds of hours of preparation may have to be presented in a few minutes. The wrap-

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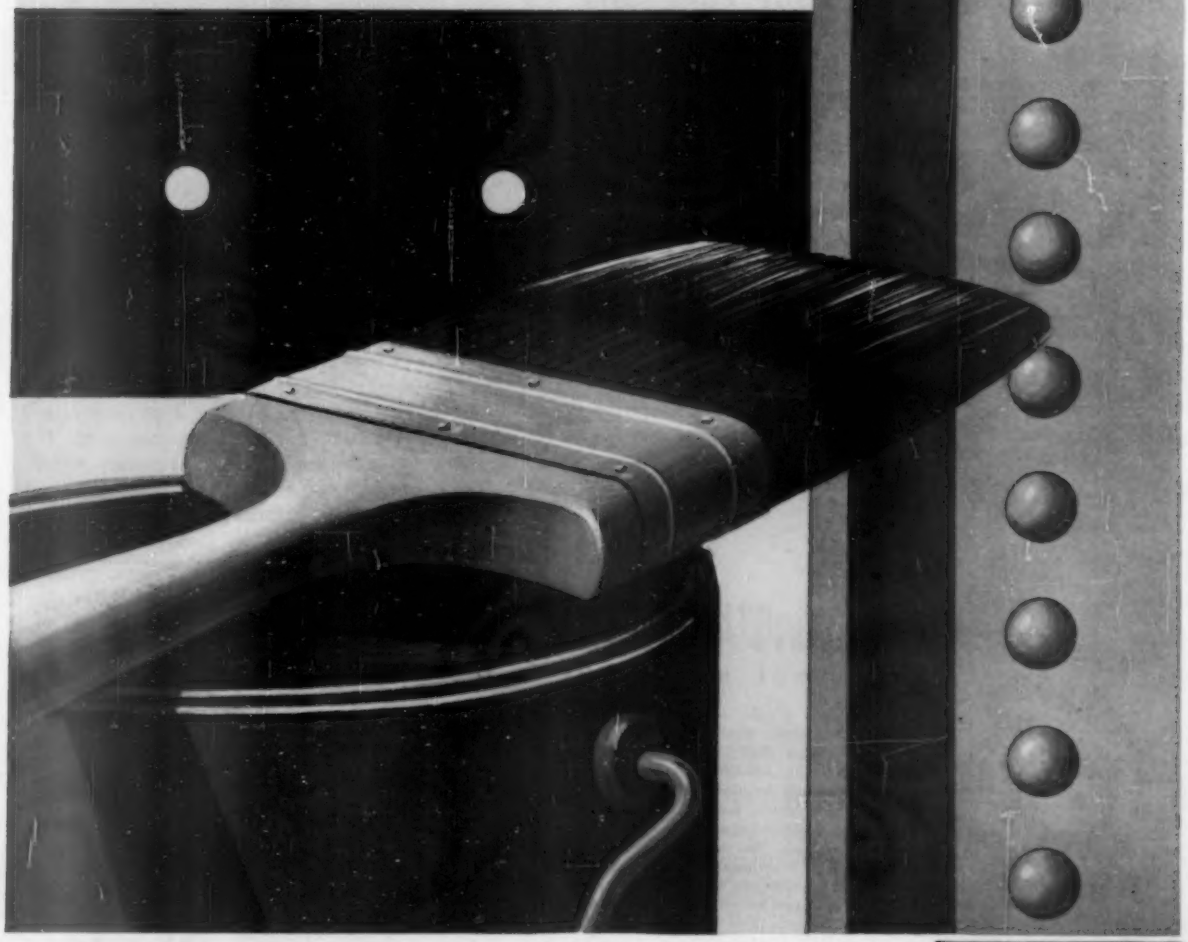
You don't have to pay a lot of money for coatings that provide long-term protection in the most corrosive atmospheres. Our high-grade coal-tar cold coatings are applied by brush or spray without heating or activation. Their properties include chemical resistance, heavy coating thickness per coat, and fast drying. And they are surprisingly economical.

Here are some typical industrial uses of our cold applied coatings: pipes, valves and connections; fences, grates and other open metal work; interiors of potable water tanks; cranes, conveyors and handling equipment. The applications are endless. But the result is always the same—highly effective protection at low cost. Let us help you introduce these economical coatings into your plant maintenance. Write for particulars—prices—literature.



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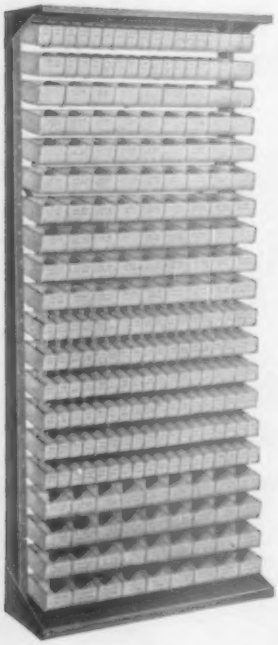
". . . if you are not acquainted, get wise to the time, space and money 'Handee Andee' bins can save your company"



Sturdily constructed for long hard use . . . compactly designed for maximum space saving. With their "easy-to-see", "easy-to-reach", "easy-to-arrange" features, it's easy as A B C to keep small parts in apple-pie order all the time. Available in 3 sizes, and designed to hold 4 sizes of bin boxes in any arrangement you wish to make. Bin boxes can be removed or replaced "quick-as-a-flash" . . . just slip them on or off. They have large label holders for fast identification, curved bottoms for speedy removal of parts, and their forward tilt provides instant visibility of all contents.

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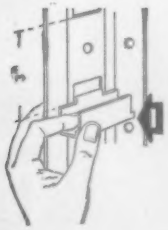

Most simple — most adjustable — most rapidly assembled steel shelving on the market. Except for the top shelf (2 bolts and 2 nuts), no other bolts or nuts are required for shelves. Just insert Shelf Support Brackets into post slots . . . no fumbling with studs, bolts, nuts or lock washers . . . tilt shelf into Support Brackets, and shelf is ready for loading. You need no special tools for assembly. Each individual unit is complete in itself . . . no part depends on unit next to it . . . any unit or part can be moved independently.

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up must be lucid—communicate fast. I use graphic methods wherever possible"—Budget engineer.

From C. A. Sharpe, senior vice president, American Bosch Arma Corporation (Hempstead, N. Y.) come these sage *do*'s and *dont*'s:

- Don't compare production conditions (product, volume, etc.) that aren't alike.
- Don't use ideal conditions in calculating expected costs.
- Do include the intangibles in your presentation.
- Do consider alternate proposals that may be simpler, less costly.
- Don't overlook sales and product design considerations.

TWO TIPS FOR SUCCESS

First, to the project originator: Get top-brass reactions to any sizable project before you spend time and money on details and cost comparisons. A screening of all requests at General Electric's Rome (Ga.) plant has eliminated 21% of the workload of project estimators.

Second, to top management: Don't let requests for improvement from plant operating people die on the vine if you want to keep ideas flowing in. When a project is rejected, tell the originator why. It's better for him to know money doesn't grow on trees, or other projects had to have priority, or a better idea won out, than to let him stew about an idea he thinks the company never bothered to look at.

You'll get more help . . .

. . . in gathering and analyzing cost data from these articles in your back issues of FACTORY. Reprints of some (noted by code numbers) are available from Reader Service, FACTORY, 330 W. 42nd St., New York 36. Order by code number.

"Mechanized Maintenance Control," March 1956 (Reprints available, 50¢ each. Code No. R-9.)

"Find and Control Maintenance Costs," March 1953. (Reprints available, 50¢ each. Code No. R-10.)

"Facts and Figures for Purchase of New Equipment," April 1953. (Reprints not available.)

Don't wait for production to stretch your electrical system

POWER-UP

for distribution system flexibility you can depend on

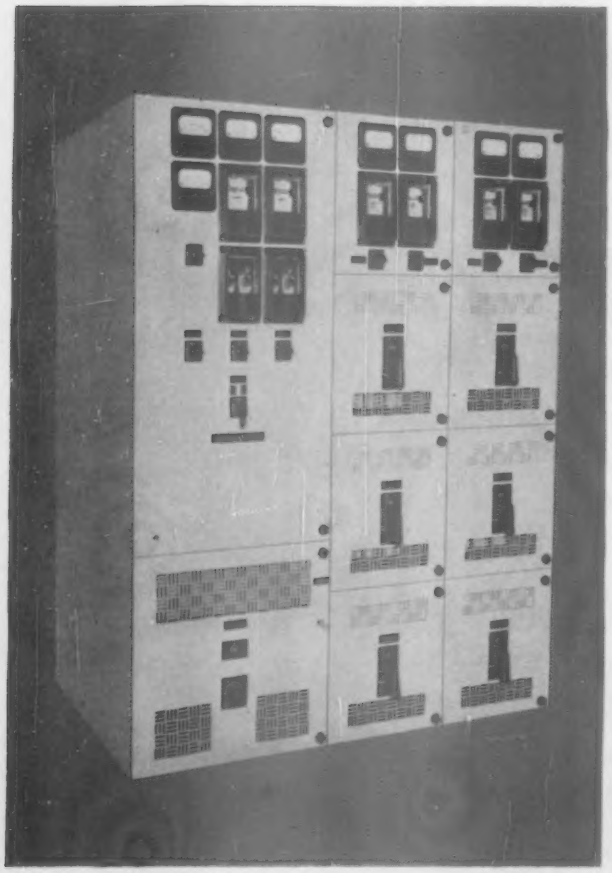
Take a good look at the electrical distribution system in your plant. As production becomes more automated, power needs increase and allowable voltage tolerances grow smaller. In fact, if your plant is average, kilowatt consumption is increasing 8% per year. You can't wait for production to demand electric power—your POWER-UP program must start today—

J-96117

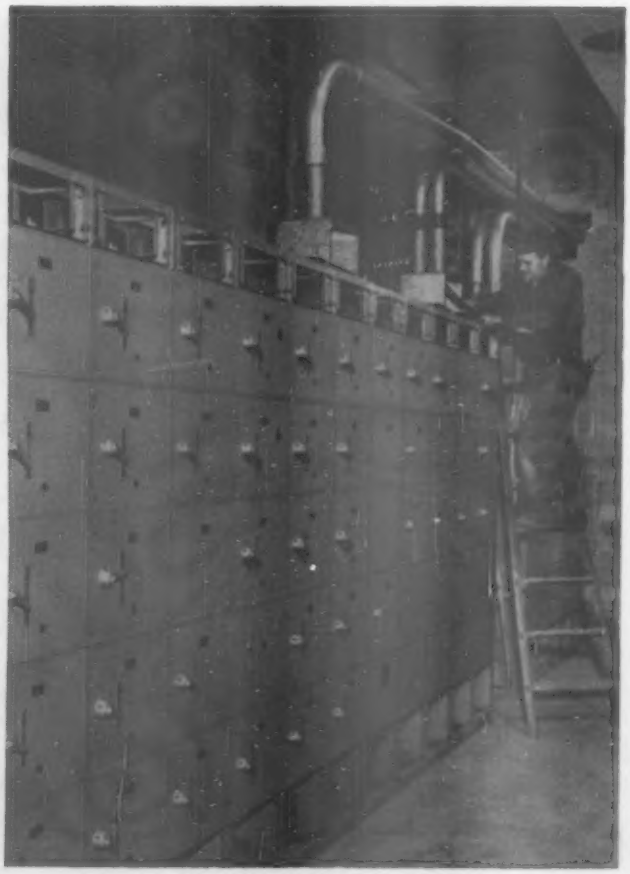
→

YOU CAN BE **SURE**... IF IT'S Westinghouse

Here's how a POWER-UP program can give electrical system flexibility to meet production requirements



WESTINGHOUSE LOW-VOLTAGE METAL-ENCLOSED SWITCHGEAR with drawout DB Circuit Breakers provides superior power circuit protection and flexibility in operation and maintenance. Standardized design with "custom assembled" features meets all modern application requirements without special design or engineering costs.



WESTINGHOUSE CONTROL CENTERS provide flexibility unlimited by floor arrangements and number of starters in use. Versatility is offered by quick addition or removal of structures and easy relocation or replacement of starters. Compact centralized control in one basic design assures coordinated motor operation.

What happens when a distribution system can't be stretched another inch? Additional machines can be the reason — changing production requirements can cause it, too. The only answer is an adequate distribution system with the built-in flexibility to meet your future requirements.

That's why it is important that you call on Westinghouse industry-experienced engineers now, for help in planning your POWER-UP modernization program. For convenient, economical, machine-site power, Westinghouse can furnish the assistance and the work-together equipment you need to do the *complete* job.

A Modern Westinghouse Distribution System assures you the advantages of convenient layout — easy maintenance, too. There's profit in planned power. Call your Westinghouse salesman. Or, write Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

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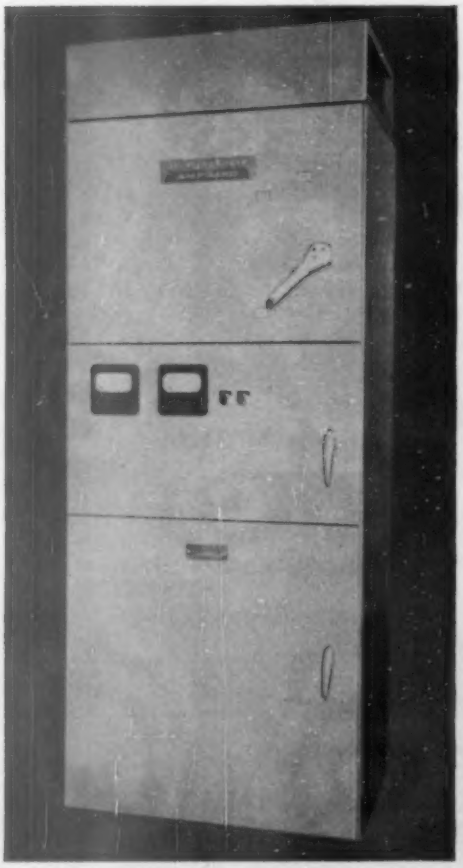

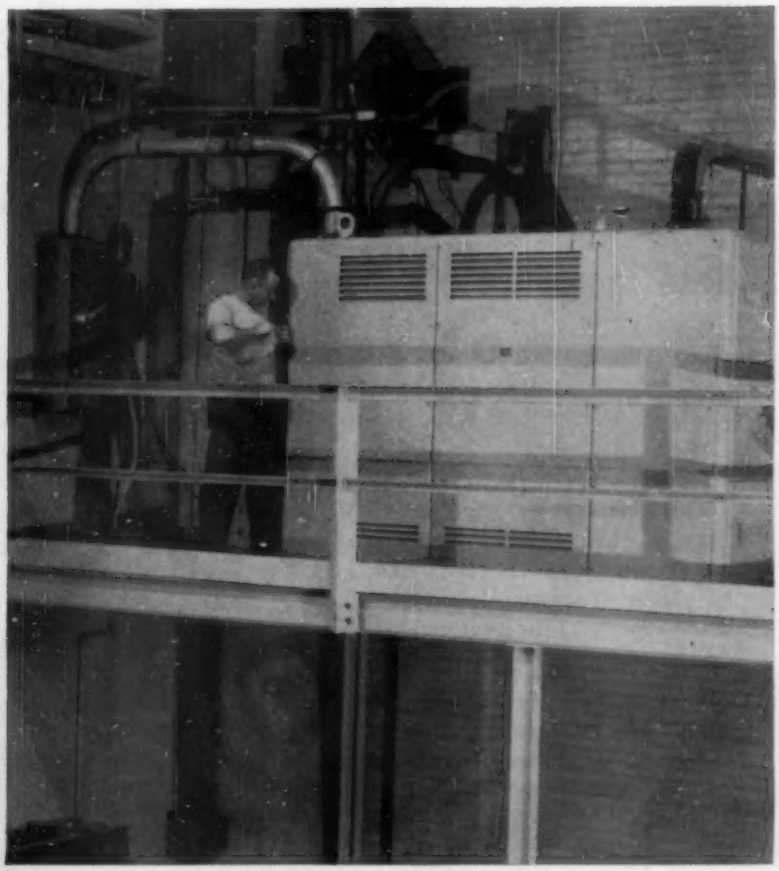

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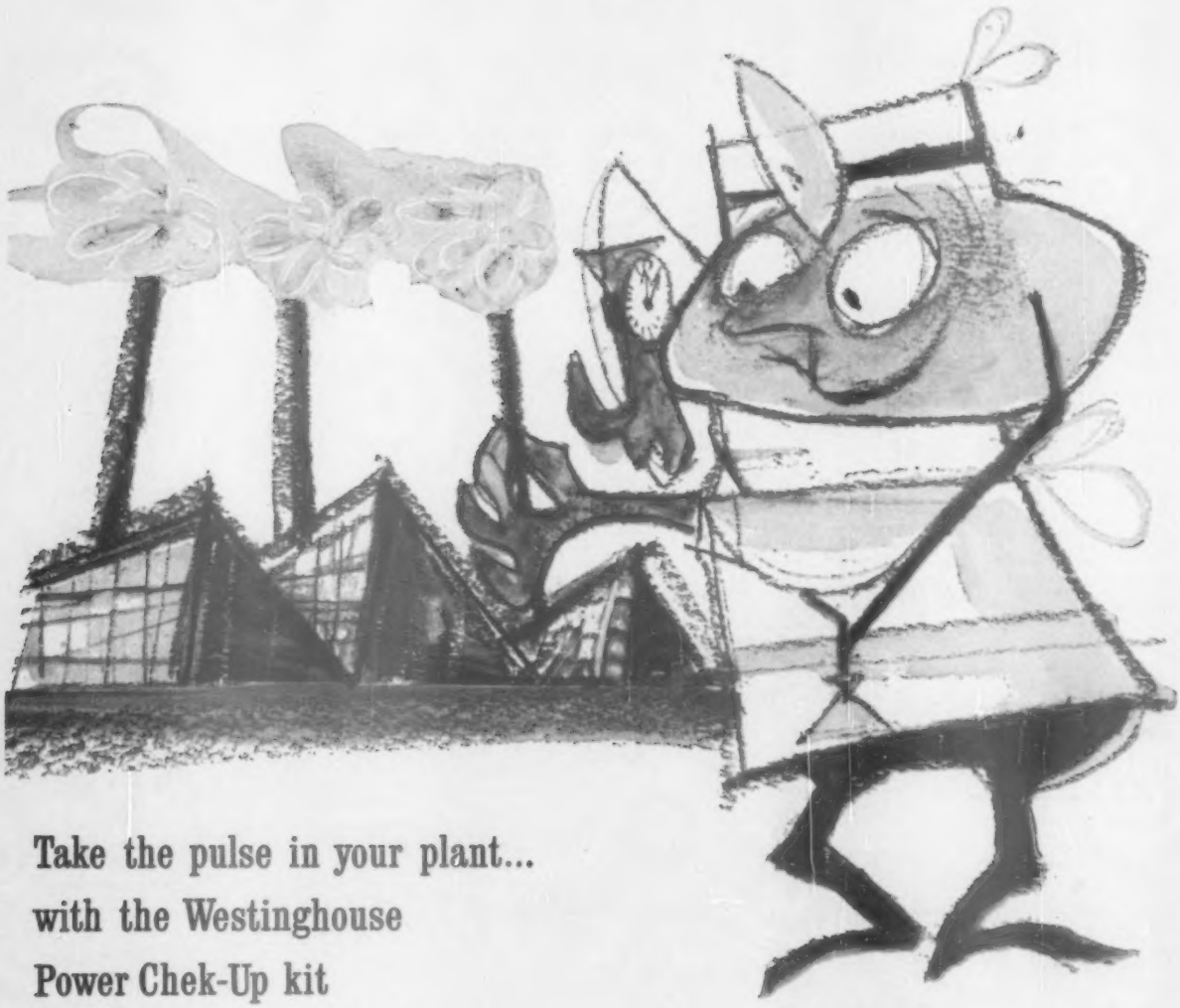

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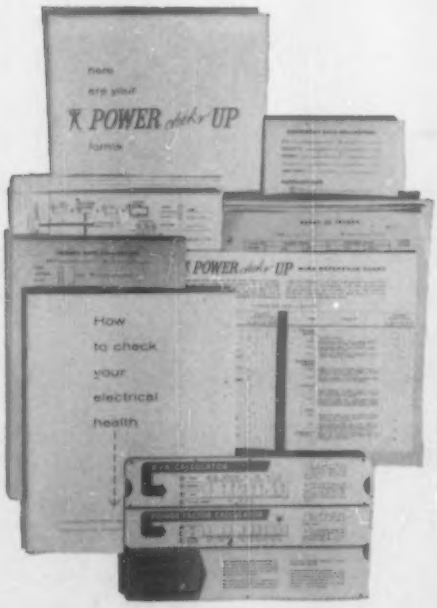

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Associated Films, Inc., 347 Madison Ave., New York 17.

The Red-Strand is a "guided tour" through a modern wire mill. Depicts the production of finished wire from rod, the steps of patenting, cleaning, coating, drawing, and spooling. Also shows the straight-through process with a minimum of handling. 16mm, color, sound, 22½ min. For loan, write:

Leschen Wire Rope Div., H. K. Porter Co., Inc., 2727 Hamilton Ave., St. Louis 12.

Sinews of Steel presents dramatic sequences on refining by vacuum and by oxygen, milling by automatic electronic devices, and the fine art of alloying. This country's ability to produce steel and the continuous quest for improved processes and products is stressed. 16mm, b&w, sound, 15 min. Price, $35. Write:

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Delta Star Electric Div., H. K. Porter Co., Inc., 2437 Fulton St., Chicago 12.

Booklet listing 147 films on machine tools and machining operations is available. Most of the films are 16mm, sound, with many in color. For free copy, write:

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FACTORY
MANAGEMENT AND MAINTENANCE

LABOR RELATIONS NEWS

By PAUL A. KING, Attorney, Bigelow-Sanford Carpet Company, Inc., Member, New York Bar

Employees and Alcohol Don't Mix

These cases of drunkenness point up (1) drunken attendance regulations, (2) alcohol trouble at parties, and (3) limiting contract clauses.

Arriving at work drunk—unfit to work—can be construed as an absence in the eyes of an arbitrator.

The central figure in this case had a poor attendance record. In fact, just one more case of absenteeism would have justified discharge on those grounds. But his next infraction of company rules was not absence. Instead, he reported to work drunk. The company doctor examined him, pronounced him too drunk to work. So he was sent home by the company.

Then the company fired the man for excessive absenteeism. It considered his drunk appearance at work the same as not reporting at all. The employee contested the discharge on the grounds that he had reported to work, should not have been discharged for being absent.

The arbitrator upheld the company. He recognized the claim of excessive absenteeism as valid, agreed that arriving at work too drunk to perform the job is the equivalent of being absent.

If you have an old rule about drunkenness in your plant, a scarce-but-desirable contract clause to limit the arbitrator's authority might be a good idea.

In the Lynchburg Foundry Company an employee was fired for being drunk on the job under a rule of 30 years' standing. The arbitrator who first heard the case decided that the penalty was not reasonable. He ordered reinstatement in view of the employee's 13 years' service —also because he had reported to his foreman to find out if he could go to work. This arbitrator was not limited by a specific contract clause to determining whether the employee had, in fact, been drunk. Had there been such a clause, he would have been powerless to change the penalty.

In this particular case, the company and the union put the issue to a second arbitrator. The second guy ruled that the discharge should stick, because he felt the first arbitrator had exceeded his authority. But this one was an exception. Most second arbitrators tend to rule as the first did. They review the reasonableness of the penalty unless the contract has a limiting clause.

Drunk behavior by workers at alcoholic company parties can't be disciplined as though it occurred on the plant premises.

Workers who want to get even with the boss, and get away with it, can wait for the annual Christmas party. If they drink enough at least to look and sound potted (even if they happen not to be), they can chuck the contents of a can of beer at the boss, cuss at him, and throw (but miss) a punch or two at him. This is part of the Christmas game, ruled an arbitrator. A paper company employee who did this was laid off for a month and was later reinstated by the arbitrator.

What an employee does off the job is not subject to discipline unless related to the proper operation of the plant, the arbitrator explained. This was conduct off the job, had nothing to do with the plant's functioning. It resulted from too much to drink. It was not the conscious act of the employee, he went on. Management's authority was not undermined. Most of the employees at the party no doubt looked at it as the act of a drunk —not to be taken too seriously.

As a second line of defense for his conclusion, the arbitrator noted that the company assumed the risk of this kind of escapade by the mere act of supplying free liquor in large quantities.

Job Duties Must Be Written

If ability to work overtime is to be a qualification for promotion, your written job specifications had better say so.

The company felt that the job of chief pipefitter required a lot of overtime. Employee Bill Dolan, it thought, was not available to work the amount considered necessary. Dolan previously had turned down a lot of overtime opportunities, and the chief pipefitter job required much weekend and emergency work.

But Dolan was the most senior employee and was given the job. However, before he actually started work, the union advised the company that Dolan's doctor permitted only limited overtime work for him. The company then rejected him on the grounds that he was not up to the job physically.

The arbitrator ordered the company to give the employee a chance, try him out on the job. His previous refusal to work overtime is no reason to assume he'll do so when he has accepted a job with a higher responsibility. He might decide to live up to it. If his health on the job turns out to be so bad that he can't do it, said the arbitrator, he can be removed just like any employee who doesn't perform his job. But overtime cannot be considered a qualification for a job promotion unless it is written into the job specification, is part of the union contract.

Turn the page

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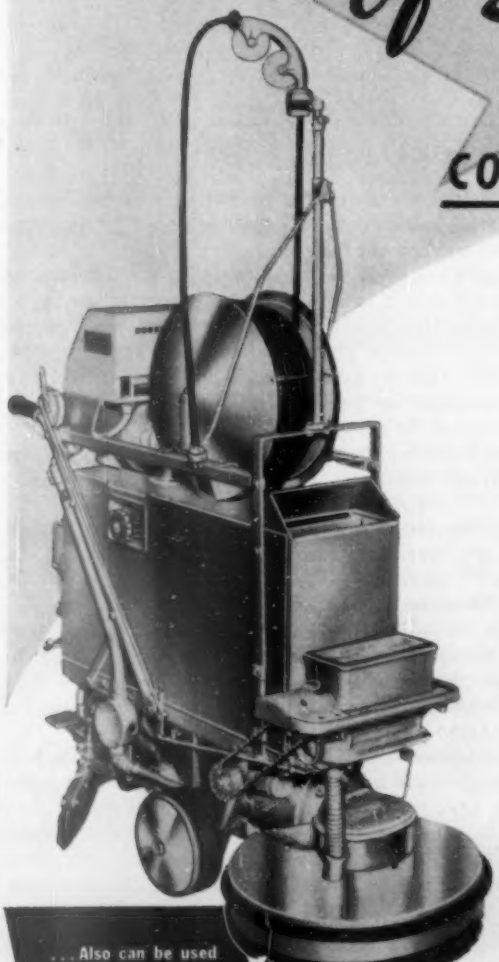

...Also can be used for dry work—steel-wooling, et cetera

(Powder Dispenser is an accessory)

Today, even buildings with but 2,000 to 15,000 sq. ft. of floor space can reap the labor-saving, cost-reducing benefits of *combination-machine-scrubbing*. Here's a *Combination Scrubber-Vac, Finnell's 418P* at left, that's specially designed for such buildings. This *electric* unit, with its 18-inch brush spread, cleans floors in *approximately one-third the time* required with a conventional 18-inch machine and separate vac.

The *418P* applies the cleanser, scrubs, and picks up (damp-dries the floor)—*all in one operation!* Maintenance men like the convenience of working with this single unit... the thoroughness with which it cleans... and the features that make the machine simple to operate. It's *self-propelled*, and has a *positive* clutch. There are no switches to set for *fast* or *slow*—slight pressure of the hand on clutch lever adjusts speed to desired rate. The powerful vac performs quietly. Compactly built, the *418P* also serves advantageously in larger buildings for the care of floors in narrow aisles and congested areas, and is available on lease or purchase plan.

Finnell makes *Scrubber-Vac Machines* for small, vast, and intermediate operations, and in *gasoline* or *propane powered* as well as *electric* models. From this complete line, you can choose the size and model that's exactly right for *your* job (no need to *over-buy* or *under-buy*). It's also good to know that *a Finnell Floor Specialist and Engineer is nearby* to help train your maintenance operators in the proper use of the machine and to make periodic check-ups. For demonstration, consultation, or literature, phone or write nearest *Finnell Branch* or Finnell System, Inc., 2511 East Street, Elkhart, Indiana. Branch Offices in all principal cities of the United States and Canada.

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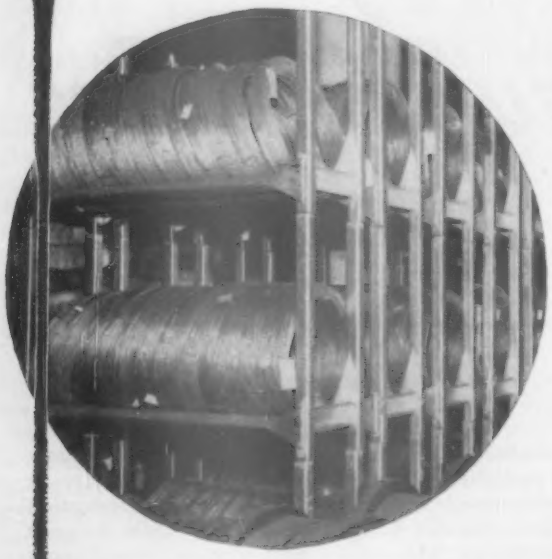

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Begins on page 192

Union Data Request Refused

This employer didn't have to fork over information just because the union asked for it.

The employer was an insurance company. The union contract gave it the right to change territories assigned to agents. When the contract was six months old—with 30 more months to go—the union demanded data about the number and nature of past territory shifts and the company's future plans in this area.

The NLRB general counsel refused to issue a complaint. He pointed out that the union waived its right to grieve on the subject and therefore the data weren't necessary for administrative purposes. And since the contract had 30 months in which to run, the data certainly weren't presently needed for negotiating purposes.

Score to Date in '58

Predictions were that 1958 would be a fat year for negotiating union contracts—unions would get less. But it hasn't worked out that way.

At least not in the first half of 1958, according to an AFL-CIO report just mailed to its negotiating team: "Most unions have not been led into abandoning reasonable wage demands. Except at the most sorely depressed companies, unions have insisted on and employers have been prepared to provide reasonable wage increases regardless of the general economic picture."

Here's the boxscore tabulated by the union (fringe benefits not included). Of the increases . . .

. . . 25% were for 13¢ or more an hour.
. . . 55% were for 10¢ an hour or more.
. . . 75% were for 7¢ an hour or more.
. . . 20% were for 4, 5, and 6¢ an hour.
. . . 2% were for 1, 2, and 3¢ an hour.

And 7% of all settlements closed out without any wage increase at all—but these were in depressed industries, the union claims.

In acknowledging a tightening-up effect, the union report says:

"The recession probably has helped limit what otherwise might have been larger wage increases . . . Some unions have not been inclined to press as far as they might have under more prosperous conditions . . . Some wage negotiations have been postponed. There have been only a few such cases, but they involve relatively large numbers of workers."

Painter Keeps His Brush

Painters are entitled to be negative in their effort to extend labor opportunities, ruled this court.

Once more painters have landed themselves in court in their attempt to limit employer use of paint rollers and spray equipment. This time it happened in California and the question was whether or not such limitations violated California's anti-trust laws. These laws forbid all combinations restraining trade and preventing

Penetrates through rust
like coffee soaks into a sugar cube!

How much do you spend on removing rust before you paint? Why not coat right over the sound rusted metal with Rust-Oleum 769 Damp-Proof Red Primer after simple scraping and wire-brushing to remove rust scale and loose rust... saving time, money, and metal! Rust-Oleum's specially-processed fish oil vehicle penetrates through rust to bare metal—while the surface film remains *tough, firm,* and *durable*. You cut costly surface preparations, you receive nearly 30% greater coverage depending upon the condition and porosity of the surface—and you receive the *maximum* in over-the-years protection!

Whatever your color choice may be—Rust-Oleum finish coatings include the color you want. They're manufactured under the same *exclusive* formulation as the Rust-Oleum Primer . . . they assure you of *greater* compatibility, *double* protection, and *lasting* beauty! The best way to see what Rust-Oleum will do for you is to actually try it yourself . . . around your plant or home.

See our complete catalog in Sweets, or send the coupon for a free Rust-Oleum Test Sample . . . one brushful means *more* than a thousand words. Prompt delivery from Industrial Distributor stocks.

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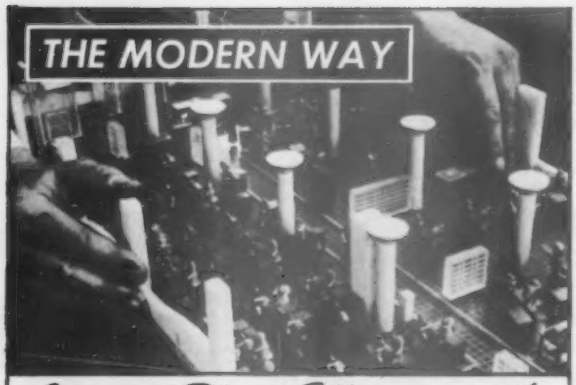

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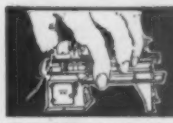

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competition. Not in this case, ruled the California Superior Court. The real objective of the union in this instance was not to restrict commerce but to extend labor opportunities and obtain advantages in wages and hours of employment.

The court conceded that this might have been a negative way of achieving labor objectives. Pointed out that the earth-digging industry doesn't insist that earth be excavated with a pick and shovel but merely pays the power shovel operator a higher-than-usual wage. Sort of passes on to him part of the employer's technological change savings.

Worker Refuses Bump, Gets Pay

Are bumped employees who refuse lower rated jobs entitled to unemployment pay? New York's commissioners have decided they are.

The law of most states disqualifies employees for idle pay if they quit their jobs without good cause. In this New York case, the union contract provided for bumping before layoff with no loss of seniority after the bump. A skilled employee who was paid $2.63 an hour was offered a lower-rated job of $2.48½ an hour. He turned it down saying that his vacation and severance pay benefits would be adversely affected if he was terminated while in this new job.

The Unemployment Compensation Appeals Board allowed him his insurance benefits. It gave this reason: He was offered a lower grade of work for which he was not fitted. His vacation and severance benefits would be adversely affected as he had contended.

The commissioner who appeared before the Appeals Board made much of the fact that there was only a 6% difference in pay between the two jobs. This, according to recent rulings, was not enough to justify the employee's refusal to accept. But the commissioner's arguments were overruled.

Previously the Board had considered this type of union contract provision to be binding on the employee. Any refusal to accept a bump amounted to a voluntary quit. This line of thinking now appears to be out in New York State.

OK to Contract Work Out?

An employer has the right to change operating method unless specifically prohibited by the contract.

The Grand Rapids Milk Division of National Dairy Products Corporation, processors and distributors, thought it might be more profitable if they gave up their local processing plant, sent milk in from another processing plant. House-to-house distribution could be done by independent contractors.

You can't do this, complained the union. To prove it, it went to a district court under the Taft-Hartley Act asking for a temporary restraining order and injunction until the question was decided (under the contract) by an arbitrator. What was the question? The first question

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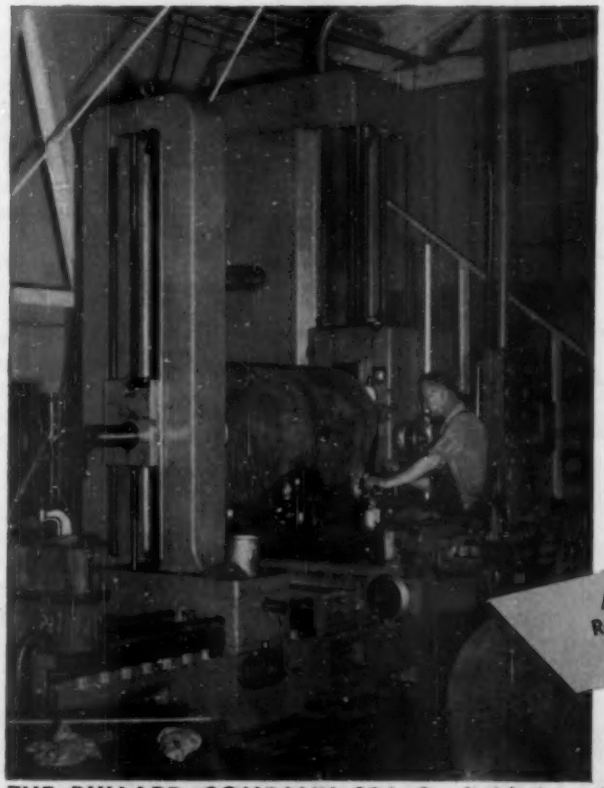
we bought a . . . "BULLARD" H.B.M. model 75

This statement by Mr. Reed Clark, General Manager, C. & H. Machine and Engineering Company, Berkeley, California summarizes, after thoroughly investigating and comparing competitive machines, their conclusion.



If you are planning to purchase a horizontal boring machine, we invite you to compare, feature for feature, the Bullard H.B.M., Model 75 with other machines in its field. You will discover that — "To Cut Costs When Cutting Metal — Buy Bullard" — is sound advice.

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Begins on page 192

was whether or not the matter was arbitrable. The union based its case on a discharge of employees in violation of the contract; the company on its inherent right to run its business in the most economical manner. In the absence of specific language in the contract, it could contract work out, the company argued.

The court ruled that the reasons for the change of operations were not illegal. The employer had a right to do so if not prohibited by specific contract language. Only those matters contemplated by the contract were arbitrable. This was not arbitrable.

Wage-Hour Informants Disclosed

This employer forced the Labor Department to tell the names of wage-hour law informants.

Any company hit with a federal wage-hour violation knows how difficult it is to get the names of informants from Labor Department agents. This employer, however, persisted and got the names when sued by the Department for an injunction restraining his violation of the minimum wage provisions of the law. He asked for the name and address of any person from whom the Secretary of Labor had received its information. A U.S. District Court ordered that it be given.

True, said the court, there are instances in which government file material need not be disclosed. For example, military secrets and security information need not be told. But here the disclosure of those who have given written statements is essential to a fair determination of the matter, and necessary to help the employer adequately prepare his defense. The court was not impressed a bit by government argument that disclosing names would cause employees in the future to clam up and not give data to the government for fear of employer retaliation.

* * *

Shop stewards manual. The AFL-CIO Department of Education has published a new manual for shop stewards. Copies are available from the Department at 815 16th Street, N.W., Washington 6, D. C. (20¢ per copy—lower prices for quantity purchases). What the other side does may be helpful.

Rules for hiring halls. Interested in union hiring halls? NLRB General Counsel Jerome D. Fenton came out with a 45-page document answering questions on the application of the NLRB's ruling on operating hiring halls lawfully. It's been published in full in Vol. 42 of the *Labor Relations Reporter*, Bureau of National Affairs, Washington, D. C.

Hiring the aged. If you're a New York State employer with a legitimate reason for not wanting to hire older employees, you can gratify your wish without violating the new law against old-age discrimination. Just file a statement with the State Commission setting forth your reasons. Unless the Commission disagrees with you, you'll not hear from it thereafter.

Out of these ovens comes a new concept in American missiles

It's a black rubbery solid, known technically as cured polysulfide polymer and popularly, as solid rocket propellant.

Until recently America staked its missile and rocket program on liquid fuels.

But the Thiokol Chemical Corporation of Trenton, New Jersey, stuck by the unpopular theory that solid rocket fuel was not only feasible but actually more practical than liquid fuel.

The "unpopular" theory was tested and proved. Now, prospects are that the rockets of the future will be propelled into space by this black rubbery substance that a few short years ago was used only for making oil and gasoline hoses.

Already the 500-mile Pershing missile, the booster stage of the Army's Nike-Zeus anti-missile missile, and the Air Force Bomarc surface-to-air ramjet missile are slated for solid fuel. And in the offing is a solid-propelled ICBM.

In Thiokol's Marshall, Texas, plant these steam-heated Despatch Ovens cure a combination of propellant mix and liquid polymer to solid fuel inside the rocket engines. The ovens are also used to cure engine linings and to preheat cores before the casting operation.

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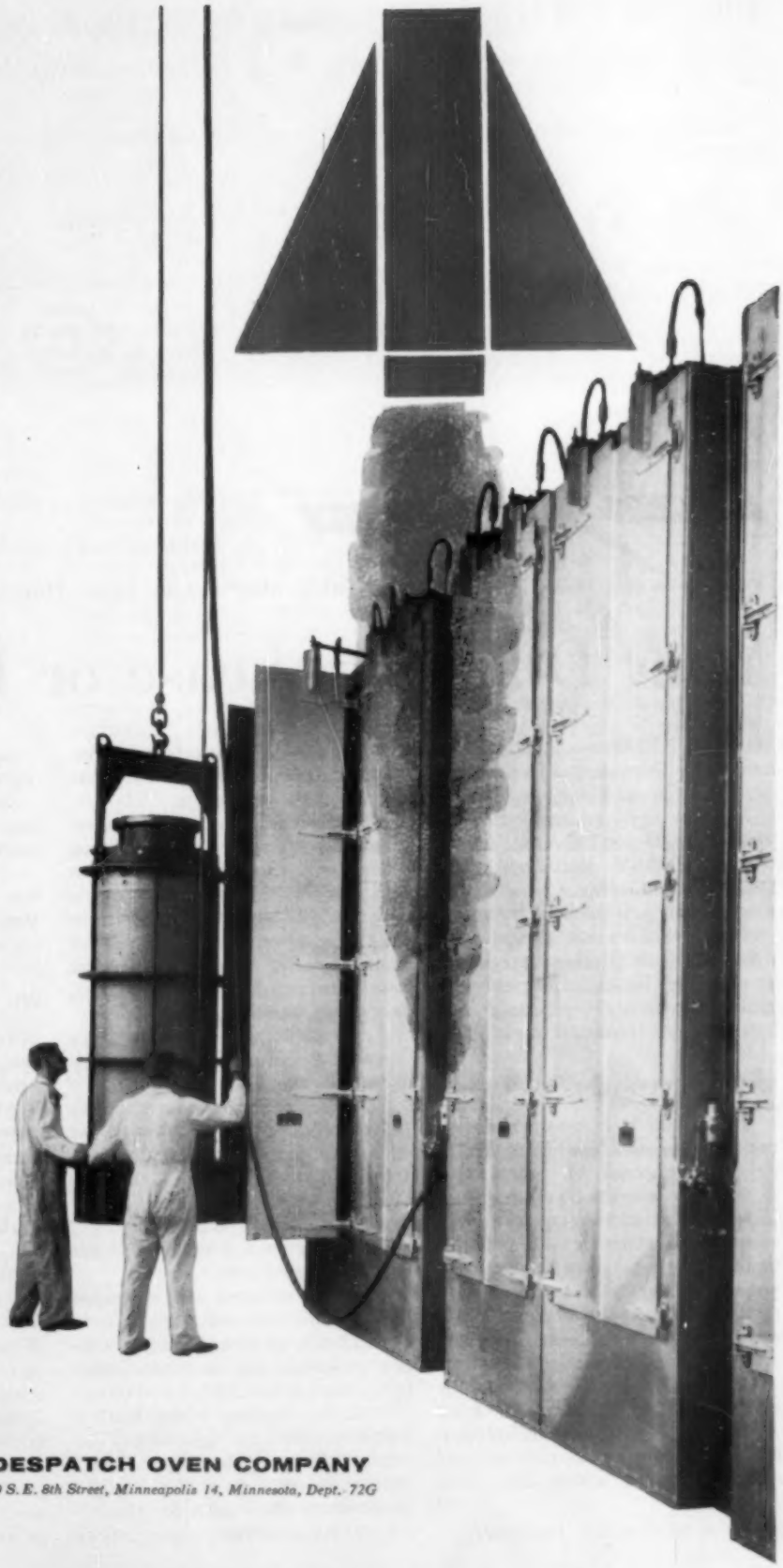

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- Mobile materials-handling equipment—Lift trucks, fork trucks, tow trucks, and the like.
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- Maintenance equipment—For instance, vibration analyzers, optical tooling aids.
- Engineering and drafting equipment.
- Plant service equipment—Air compressors, welding generators, pumps.
- Laboratory equipment.
- Buildings—Production, warehouse, and office space.
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Leasing what you need may solve some of your modernization problems. But it may not be best. Here's help for . . .

Your Dilemma: Lease or Buy?

SO YOU NEED new equipment to modernize your plant and its facilities. What about leasing it?

Majority opinion among the 81 plant operating and financial executives FACTORY interviewed about modernization is this: Cheapest way to get what you need is to buy it outright. But it's not a unanimous opinion. Some of these executives go strong for leasing. And some who prefer purchase will go along with leasing if conditions are right.

WHEN LEASING IS OKAY

The pitfalls in leasing are loosely drawn agreements and disappointed expectations about tax savings. But if you can get what you need by leasing and if contract terms are favorable (panel above)—and if the financial and operating conditions in your plant show that leasing is better than buying—leasing may solve some of your obsolescence problems. And may save you some money, too.

What conditions make leasing okay? Here they are:

. . . *If you're shy of capital,* or your cash reserves are low, or your operating funds are running thin.

. . . *If you want to modernize* without tying up capital over the working life of the equipment.

. . . *If you want to keep modernizing* year after year—and if you see leasing as a way of replacing obsolete equipment at regular intervals (that is, whenever a lease expires).

. . . *If you want to increase or replace capacity* without taking on long-term obligations (bank loans, mortgages, and the like).

. . . *If you have to reduce capacity* —and can get rid of over-capacity by terminating your lease.

. . . *If you're approaching the limit* of your bank credit and don't want to commit what's left of it to long-term capital investment.

. . . *If you're faced with tight money* and high interest rates.

. . . *If you need certain equipment* for a short time only.

. . . *If you're faced with a temporary surge* in demand.

. . . *If you're experimenting* with new processes and methods—want to try out equipment before buying.

. . . *If you need equipment* that requires bothersome, specialized, or expensive maintenance—or costly insurance—and you prefer that the lessor worry about these for you.

. . . *If you need equipment* that has a high obsolescence rate—and you want the lessor to carry that burden.

. . . *If your company's purse-string holders forbid you to buy,* though you've got to have the equipment.

. . . *If you see leasing* as a sure way to cut taxes. (But watch out. You and the tax collector must see eye to eye on this.)

WHAT PLANT MEN SAY

Take a short run-down on plant operating and financial men. Their views on leasing go like this:

Absolutely no—A good many companies take this firm stand. For example, Frank Griesinger, assistant treasurer, Lincoln Electric Company (Cleveland), says, "Our company has a simple policy on leasing anything. It's no."

Ralph E. Williams, works manager, and V. D. Amodeo, controller, De Laval Separator Company (Poughkeepsie), share Griesinger's opinion: "If you need production equipment," they say, "buy it outright. Fortunately we've been able to do it this way. . . Interest rates on some leasing plans are outrageously high. You can't afford to do much of it. Leasing company wants to recover its money in three years.

By W. A. STANBURY, FACTORY

. . . AND HOW YOU CAN BE SURE RENT IS TAX DEDUCTIBLE

Don't accept a lease contract . . .

- If it gives you any equity in the equipment.
- If total rent equals purchase price and if you get option to buy for nominal sum at lease expiration.
- If title passes to you after you've made a certain total of payments.
- If rent is greater than current fair rent.
- If any part of rent is identified as interest.
- If the agreement calls for a finance company to buy the equipment from maker subject to the lease.

Do accept a lease contract . . .

- If it's short term.
- If rent is high in relation to equipment value.
- If lessor pays for maintenance, insurance, etc.
- If option-to-buy price is close to fair market value at time option is exercised.
- If rent is based on mileage or units produced.
- If the agreement is made with a company whose principal business is leasing.
- If the contract may be terminated on due notice.

Manufacturer has to take 17 years. Yet when you buy you have to assume the risk of obsolescence."

Some companies that have leased equipment in the past turn away from it now. Take American Machine & Foundry Company. T. R. Dreyer, vice president-manufacturing (Brooklyn operations) reports:

"Recently a study of comparative costs indicated a decided advantage in owning trucks instead of leasing them. So we canceled our leasing arrangement and bought our own trucks. We've considered leasing machines on several occasions, especially for products that will be in demand for only one or two years. In each case, however, leasing was not economically attractive. Subcontracting is more economical."

Usually no, but sometimes yes—Biggest exception to the ban on leasing seems to be mobile equipment. Says Ben Bugbee, division works manager, Falk Corporation (Milwaukee): "We do no leasing except for mobile equipment." And Russ Fierce, chief plant engineer, Motorola, Inc. (Chicago), takes the same view: "We have no fixed policy and lease little. But we do lease all trucks with drivers. This solves a lot of problems for us."

"Only items we lease are tank cars," reports Robert Capiin, chief cost accountant, General Aniline & Film Corporation, Dyestuffs & Chemicals Division (Linden, N. J.). "We've had a couple of leasing proposals but we decided we were not interested. We did lease a few lift trucks once in an emergency—and briefly. We don't consider this a serious venture into leasing."

"We lease autos but not trucks," reports John Moorhouse, director of purchasing, Standard Pressed Steel Company (Jenkintown, Pa.). And the vice president of a large eastern chemical products company says, "We're doing more leasing each year, especially in transportation equipment—collapsible containers, railroad hopper and gondola cars."

Other companies make these exceptions to their reluctance to lease:

Howard Ely, plant engineer, American Smelting & Refining Company (Perth Amboy, N. J.), says: "We don't believe in leasing, don't think it's worthwhile. But we do it in emergency. Only items we've leased: air compressors, trucks."

"About the only time we lease is when we do our own construction work," says the vice president of manufacturing of a Midwest materials-handling equipment maker.

"We lease only odd pieces of equipment for construction or for short-term trial," says B. J. Quinn, production manager, Chas. Pfizer & Company (Brooklyn). "Leasing is expensive," he adds, "and availability of capital has not been a serious deterrent to us."

Yes, for special needs—Several plant executives report that they sometimes lease equipment to reduce the economic risks of new ventures or to take care of special short-term needs. For example, the chief project engineer of a large East Coast manufacturer of light products says:

"We have leased equipment only when the manufacturer's promise of payoff seemed unbelievably high and we felt we should try out the equipment before risking purchase. We've also leased equipment to make a short run of a new product so we could get the feel of the processing problem before laying out permanent production. But in general we feel we can't afford to lease if we need the equipment full time."

And from a large electrical manufacturer comes this view:

"We lease some equipment if the need appears to be short-term. Industrial trucks and welding generators are typical. For example, getting a new or redesigned product into production may take a month—sometimes several months—before we can get all the details working smoothly—get output up to normal. We may lease extra general-purpose equipment during these periods."

Another special need that leasing seems to solve is that of unusual maintenance. Gerard Scheyer, plant engineer, Adamas Carbide Corporation (Kenilworth, N. J.), has this to say: "There's no leased equipment in our plant right now. But I like the leasing idea if the contract specifies the owner must maintain the equipment. Then I can keep after him to keep it up."

Yes, if it make economic sense—Most companies that do any leasing at all tie their lease-or-buy decisions to the economics of particular cases. Says W. H. Beer, manager of production and engineering, Miller Brewing Company (Milwaukee): "We have no set policy on leasing. We will lease if savings are greater than we could obtain with the three-year payoff we require of new equipment. Our accounting department makes the final decision whether to lease or buy. That department is closely tied to the top management level."

Turn the page

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DILEMMA: LEASE OR BUY?
Begins on page 200

Jack D'Arcy, vice president-production, Quaker Oats Company (Chicago), agrees: "We have no philosophy on leasing. We'll lease whenever it's more economical."

And Adamas Carbide's Gerard Scheyer cites an instance in which economics made leasing the right step: "When cash was short we were going to buy an $18,000 press when total budget for the year was $22,000. We leased it, and it turned out we didn't need it full time anyway. We also leased an ultrasonic drill for a special job. Right now," Scheyer continues, "we want a vibration analyzer. We can rent it for a year for what it costs. Then if we want to buy it we can apply 80% of the rent to the cost of buying."

Open mind on leasing—That's the attitude of some executives. Listen to Standard Pressed Steel's John Moorhouse: "We've leased a few machines for temporary jobs that didn't justify capital purchase. We've got an open mind on leasing from used machine dealers, new machine makers, and the government."

"We'll lease and rent any time," says Casey B. Ver Duin, division controller, Tapco Division of Thompson Products, Inc. (Cleveland). "All our tow trucks and most materials handling equipment are leased."

Finally, though his company leases no basic equipment, W. Harvey Thompson, v.-p. and general manager of H. K. Porter's Riverside-Alloy Metal Division (Riverside, N. J.), says: "If our head office ever says we can't buy, I certainly would investigate leasing as perhaps more acceptable than doing without."

SAVE MONEY BY LEASING?

It stands to reason leasing usually will cost more out of pocket than buying. Why? Because your lessor plans to get back the cost of his equipment as fast as he can—and his rents are correspondingly high. Also, your rent will include a profit for one or more organizations—manufacturer who sells equipment to lessor, lessor himself, and finance company or bank that provides lessor with his capital.

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equipment for a long time—and if you've got the cash or credit to buy—you should look carefully at costs before you decide to lease. A comparison between out-of-pocket cost of leasing and cost of investing capital and owning equipment should play a role in your decision.

You'll find guides for figuring the cost of capital investment in the article beginning on p. 90. After you've found that cost, weigh it against the cost of leasing, taking into account the gains and perils of ownership—depreciation, obsolescence, the cost of money, salvage value, alternate opportunities for investment, and other factors.

WILL LEASING CUT TAXES?

Leasing does promise savings on taxes, because rent paid under terms of a *bona fide* lease is a deductible expense. But so is depreciation. So before you make your lease-or-buy decision, you should balance gain from deducting rent against gain from deducting depreciation. Much will depend on how high your initial rent payments are (compared with depreciation for same period), how long you'll continue to need the equipment, how high a value you place on salvage of equipment you own.

If you're looking for tax savings from leasing, you or your attorney had better turn a cold, calculating eye on your lease contract. The wording of your contract—and its intent—can swing the tax collector to your side or turn him against you.

Equity the key—That seems to be the attitude of tax collectors and courts. If your contract seems in any way to establish an equity for you, you'll find it hard to claim rent as a deductible expense. So if you decide to lease, be sure about these things:

• **Contract should not include an option to buy equipment before or after expiration of lease.** If it does contain an option to buy, make sure it states the equipment may be purchased for its fair market value at time option is exercised. Some leases contain options to buy for a nominal sum at expiration. The Internal Revenue Service holds that such options mean your rents in to-

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tal are equal to the equipment value, that an equity was established at time of leasing and has been increasing ever since. IRS will let you depreciate the equipment, but you can't deduct the rent.

- **Contract ought to call on the lessor to pay maintenance, insurance, and taxes on the equipment.** For the lessee to pay these costs implies ownership.
- **Contract should call for rental payments about equal to depreciation rates on equivalent equipment.** It should specify these rates. If rent is far greater, IRS may argue you're buying, not leasing.
- **Contract should not contain a clause protecting lessor against your bankruptcy.** Such a clause would imply an equity in the equipment.

STILL MORE CAUTIONS

Besides the terms of your contract, there are other matters you should look into if you expect leasing to cut your taxes. Some of them:

- **Most lease contracts start with high rents, scale them down as time passes.** In the beginning you can charge your high starting rents against profits, thus cut taxes. Later, when you'll be paying less rent, your net will be higher, so your taxes will be bigger. In this sense, leasing only postpones taxes.
- **Fast depreciation (sum-of-digits, for example) often will equal what you pay in rent.** When this is true, leasing seldom has any tax advantage over purchase.
- **In many instances a conditional-sale purchase will serve the same purpose with regard to taxes.** With a conditional sale you can depreciate the equipment and deduct interest on the unpaid balance on your tax return. In fact, one finance company has recently announced a conditional sales plan in which installment payments, like sum-of-digits depreciation, are high at the beginning and low at the end of the term.
- **State tax rulings are important, too.** Be sure your lawyer keeps them in mind.
- **The IRS will respond to your request for pre-clearance procedure** if you want to establish the deductibility of equipment rental. **END**

Newly designed
Type H Motor Control

More room for optional features

Now, with Allis-Chalmers high voltage control, you get more panel space for additional components.

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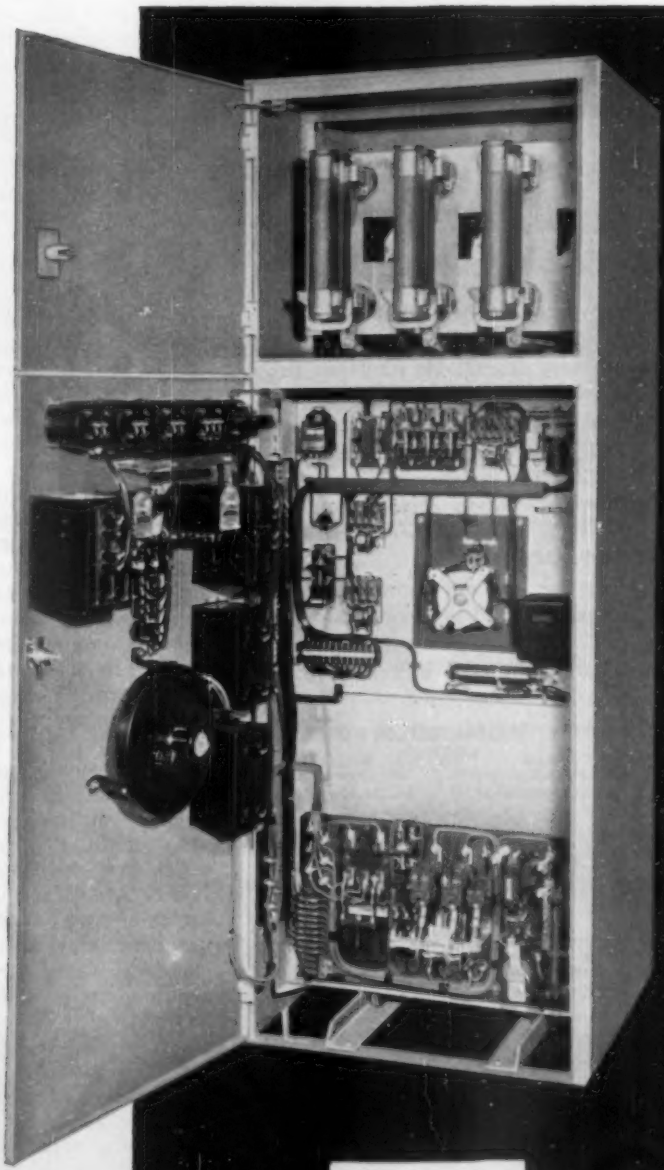
For more information on this engineering advance, contact your A-C office or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.



All this area on Allis-Chalmers new Type H motor control is available for optional features. In many applications, this extra space eliminates the need for an extra cabinet.

Removable panel, on which control devices are assembled, is mounted on inner barrier. Entire panel may be quickly removed for inspection and maintenance.

ALLIS-CHALMERS A-C

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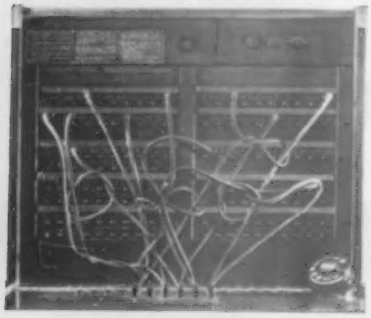

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By CARROLL W. BOYCE, Manager, Features and Departments, FACTORY

MAPI Formula Clarified

For nearly a decade, one of the really significant management techniques has suffered badly because of its pedantic, jargon-ridden presentation. We refer to the MAPI (Machinery and Allied Products Institute) formula for determining the desirability of replacing manufacturing equipment. Now the author of the formula, George Terborgh, has replied to its critics with a simplified and strengthened explanation in *Business Investment Policy—a MAPI Study and Manual.*

Dropped from the new concept of MAPI are such terms as "adverse minimum" and "operating inferiority," which used to confuse and discourage the non-professional. Instead, the reader will find straightforward terms such as "net increase in revenue" or "net decrease in operating cost" or "next-year operating advantage."

MAPI does add one term of its own that tends to make sense out of all the semantic arguments over "rate of return." MAPI now permits the analysts to compare the amount available for return on investment with the net investment required. MAPI's term for this ratio is the MAPI Urgency Rating, expressed as a percentage.

But the value of this new book lies far beyond a simplification of terms and an added clarity of writing style. It is in the shoring up of some of MAPI's previous weaknesses that this book excels. Previously, MAPI had ignored the existence of three factors that influence the desirability of an equipment purchase. These are (1) earning pattern—rate at which earnings are accumulated from year to year, not necessarily in similar amounts, (2) various methods for applying depreciation—such as straight line, declining balance, or sum of the digits, (3) income taxes—the advantages presented by tax application. In *Business Investment Policy,* Terborgh has included all three.

To the plant operating reader, this book will have special appeal because it is split into four parts, only one of which (Part III) need be read in order to apply the new formula. Part I contains interesting and perspective-forming background material. Part II details the theory of the new MAPI system. Part III is directed to the plant operating man who must make the analysis. It contains instructions and many examples. Part IV presents the front-office decisions that are needed by the analyst.

All in all, we can't see how any plant manager can conduct his modernization plans without fully understanding the implications of equipment replacement decisions as put forth in this book—whether or not he chooses to apply the MAPI formula to his own proposals.

(Review by L. R. Bittel)

Business Investment Policy—a MAPI Study and Manual, by George Terborgh. Machinery and Allied Products Institute and Council for Technological Advancement, 1200 18th St. N.W., Washington, D. C. 260 pages. $10.

A Different Slant on Administration

Did you ever wonder why the "scientific management" you read about seems to be so lacking in actual practice? Robert Roy has come up with the answer (obvious when you think about it), that "scientific" management has to be interpreted and applied by very human managers in very unscientific work environments.

Within that framework, Roy (who's currently Dean of Engineering at Johns Hopkins University) covers most of the broad areas of administration. By combining a sound understanding of scientific management and a solid recognition of the realities of administrative practice, *The Administrative Process* makes a distinct contribution.

The author relies heavily on the

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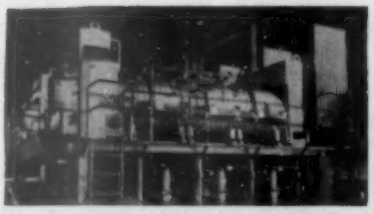

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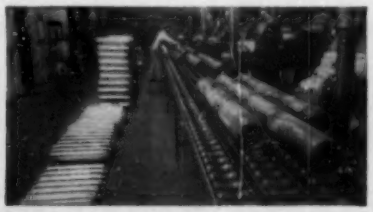

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1959

Begins on page 208

technique of illustration by example. Happily, most of his examples come from the areas of production, plant engineering and maintenance, and industrial relations; few are drawn from the fields of sales and finance as in most books on administration.

Intended primarily as a text, the writing tends to be a bit on the stiff and scholarly side. But Roy is not text-bookish to the point of patronizing his business readers. Should prove both interesting and helpful to the man on the way up—or to one who wants to be.

The Administrative Process, by Robert H. Roy. Johns Hopkins Press, Baltimore, Md. 223 pages. $5.

The First 50 Years of Harvard's "B" School

For any graduate of the Harvard Business School, *And Mark an Era* is a must, both for reading and as a treasured memento. But even for those who've had no association with the "B" School, it's valuable reading. In the development of teaching patterns and techniques, the "B" School has been the trail-blazer for business and industry. Here's a good chance to see how and why those patterns developed, and assess their implications for training within your company and also for your own personal development program.

And Mark an Era, by M. T. Copeland. Little, Brown & Co., 34 Beacon St., Boston 6. 368 pages. $6.

Manual for Foremen

Everything that's said in *Modular Management and Human Leadership* has been said before (except the explanation of what "modular" management is). It's all sound, basic stuff. Even so, there's plenty here that can help any foreman or supervisor to a better understanding of his on-the-job human relations problems—or, as the author expresses it, "of how to help workers work."

For our money, the trouble is that Author Pieper writes in a "tell-'em" style that will cause many people to

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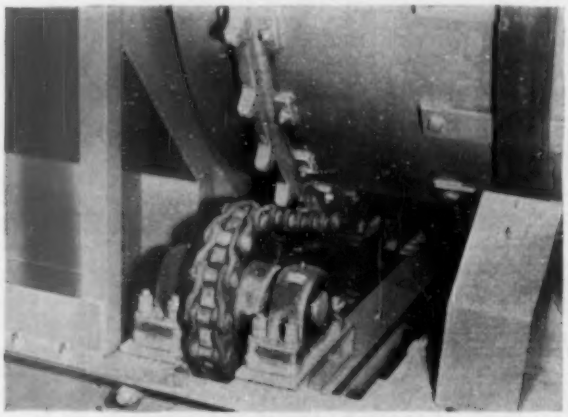
Pins and bushings of LXS chain are accurately sized . . . assuring controlled press fits, preventing rotation in sidebars. Similar accuracy in machining of sidebars permits close control of pitch and proper chain length after assembly.

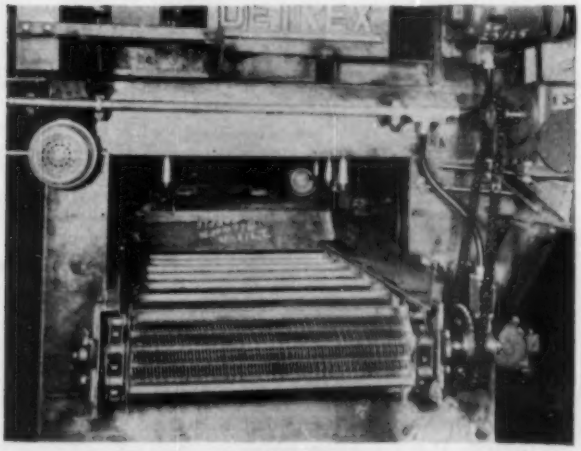
Other long-life features of Link-Belt LXS chain include use of selected steels and controlled hardening of all parts. Both contribute to greater endurance . . . greater uniformity.



LXS drives stand up to impact and abrasive service

Large, live bearing area makes LXS chain ideal for exposed drives and abrasive conditions such as found on this heavy rotating drum. Uniform distribution of load over ample bearing area reduces cutting action of abrasives . . . extends chain life.

LXS chain has stamina required for long, heavy-duty conveyors



With its exceptional strength and wear resistance, Link-Belt LXS chain can easily meet rugged conveying and elevating requirements. Due to accuracy of pitch and attachment spacing, plus close matching of multiple strands, LXS has the added strength and wear life necessary for the extra-long conveyors so important to today's highly mechanized industry.

HEADQUARTERS for chains, sprockets and other Link-Belt products is your nearby Link-Belt factory branch store or authorized stock-carrying distributor. Refer to the Yellow Pages of your local Phone Directory.

LINK-BELT

14,740

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

Smooth, quiet power transmission for heavy loads—

H & S Herringbone Speed Reducers

The Herringbone gear design provides continuous tooth action — eliminates end thrust.

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You'll find a wealth of information in our Catalog 55 describing our complete line of Speed Reducers. Write for it, or ask your nearby H & S representative.

THE HORSBURGH & SCOTT CO.
GEARS AND SPEED REDUCERS
5112 Hamilton Avenue
Cleveland 14, Ohio

Begins on page 208

put their backs up. The number of imperatives per page is vaguely reminiscent of a GI Drill Instructors' Manual. If you go for that approach, fine. Because this is a well-organized, easily understood book.

Modular Management and Human Leadership, by Frank Pieper. Methods Press, Box 4090 University Sta., Minneapolis 14. 288 pages. $6.50.

Technical Handbook Covers Automation

When three volumes of roughly 1000 pages each are devoted to a single subject, it probably rates the term "monumental work." The first volume of the *HANDBOOK of Automation, Computation, and Control* covers control fundamentals, with major sections on general mathematics, numerical analysis, operations research, information theory and transmission, and feedback control. The other two volumes (to be published in 1959) will deal with computers and data processing, and with systems and components.

The general editors are Eugene M. Grabbe, Simon Ramo, and Dean E. Wooldridge, all of the Ramo-Wooldridge Corporation. It would be hard to find a team with better technical qualifications for the job. And they have lined up a distinguished group of contributors.

The publisher's blurb says the handbook "provides an elementary frame of reference for the novice and advanced data for the expert." We'd take that with a grain of salt. If it means the novice among technical specialists, OK. But even the definitions and descriptions at the start of each chapter would be rather sticky to the man who is a complete stranger to the field.

For technical personnel at all levels, however, this is a tremendously useful book, both as working tool and reference.

Handbook of Automation, Computation, and Control. Vol. I (Control Fundamentals). Ed. by Grabbe, Ramo, and Wooldridge. John Wiley & Sons, Inc., 440 Fourth Ave., New York 16. 1020 pages. $17.

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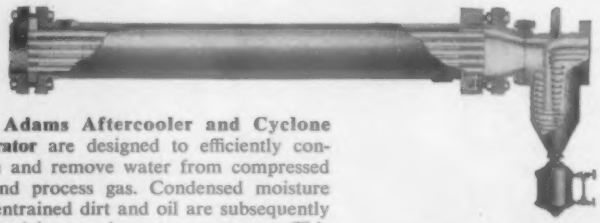
NEW CONCEPTS IN PRACTICAL OFFICE AUTOMATION

Aftercooler and Cyclone Separator designed for cleaner, dryer compressed air

R. P. ADAMS CO., INC.
215 East Park Drive, Buffalo 17, New York



The Adams Aftercooler and Cyclone Separator are designed to efficiently condense and remove water from compressed air and process gas. Condensed moisture and entrained dirt and oil are subsequently removed in a cyclone type separator. This unit is scientifically designed for maximum removal efficiency over a wide range of flow rates.

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Adams Aftercoolers and Separators are available from stock to handle 20 - 40,000 cfm with 10° cooling and 25 - 19,200 cfm where it is necessary to cool within 2°F of the cooling water. Special units can be supplied to suit an unlimited range of requirements. In all cases the maximum pressure loss at rated capacities is ½ psi.

This wide range of sizes enables the economical utilization of Adams Aftercoolers and Separators in virtually all industrial application. For further information on how R. P. Adams' units will solve your compressed air problems and save you money, write today for Bulletin 711.

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100-1000w. Dome	100-1000w. Deep Bowl	100-1000w. Semi Angle	500 & 1000w. High Bay	200-1000w. Clouded Diffuser	500 & 1000w. High Bay *		2-40w. 1A-18	2-75w. 1D	2-800 ma. 1E	3-40w. 2A-38	3-75w. 2D	3-800 ma. 2E	2-100 & 40w. 2A-38	2-40w. 1A-18	2-75w. 1D	2-800 ma. 1E
		3			1		1	ABOLITE LIGHTING DIV.									
		3	3	3		1		APPLETON ELECTRIC CO.									
		5	4	4		1		BENJAMIN ELECTRIC MFG. CO.	✓	✓	✓	✓	✓	✓	✓	✓	✓
								DAY-BRITE LIGHTING, INC.	✓	✓	✓	✓	✓	✓	✓	✓	✓
								EASTERN FIXTURE CO., INC.	✓	✓		✓					
		4	4					ELECTRO LIGHTING CORP.	✓	✓				✓	✓		
								ENDER-MONARCH CORP.	✓	✓		✓					
								FLUORESCENT FIXTURES OF CALIFORNIA	✓	✓	✓	✓	✓	✓	✓	✓	
								GLOBE LIGHTING PRODUCTS, INC.	✓	✓		✓	✓			✓	
								THE EDWIN F. GUTH CO.	✓								
								KEYSTONE ELECTRIC MFG. CO.	✓	✓		✓	✓				
								LIGHTING DYNAMICS, INC.	✓	✓		✓	✓		✓	✓	
		4			2			THE MILLER CO.	✓	✓	✓	✓	✓	✓	✓	✓	✓
								MITCHELL LIGHTING DIV.		✓		✓	✓				
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		4	3	3				OVERBAGH & AYRES MFG. CO.									
		5	3	5		2		QUADRANGLE MFG. CO.									
								RUBY-PHILITE CORP.	✓	✓	✓	✓	✓		✓	✓	✓
								SMITHCRAFT LIGHTING DIV.	✓	✓		✓	✓				
		5	3	3				SMOOT-HOLMAN CO.	✓	✓	✓	✓	✓	✓	✓	✓	✓
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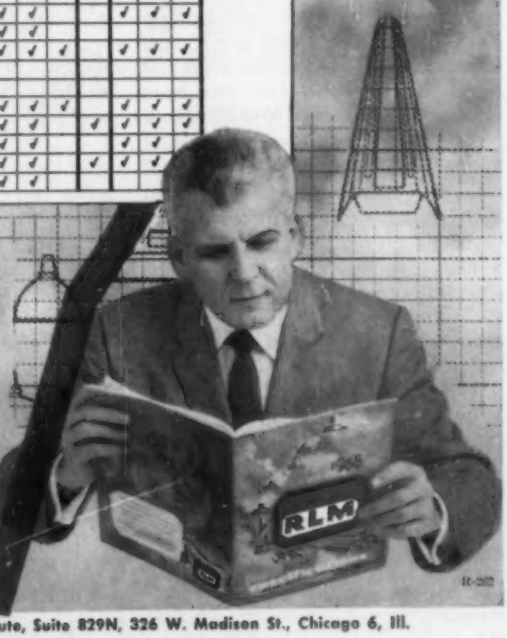
								SUNBEAM LIGHTING CO.	✓	✓	✓	✓	✓	✓	✓	✓	✓
								SYLVANIA ELECTRIC PRODUCTS, INC.	✓	✓	✓	✓	✓		✓	✓	✓
		5	4	2		2		WESTINGHOUSE ELECTRIC CORP.	✓	✓		✓	✓		✓	✓	
		5	4	2				WHEELER REFLECTOR CO.	✓	✓	✓	✓	✓	✓	✓	✓	
								WORK-O-LITE CO.	✓	✓		✓	✓				

* Aluminum Reflectors all others are Porcelain Enamel

Note: Many manufacturers make incandescent RLM Units for more than one lamp size. The numerals refer to the number of different-size RLM Units which the manufacturer offers under the specification.

RLM ADDS NEW SPECIFICATIONS FOR SPECIAL SERVICE FLUORESCENTS . . . . . REVISED SPECS COVER UNITS FOR 800 ma. LAMPS . . . . . BROADENED INCANDESCENT STANDARDS FOR REFLECTOR SIZES AND TYPES OF LAMPS . . . . . EVERY RLM SPEC STRENGTHENED, MADE MORE IMPORTANT, REVISED UP!

These are some of the reasons why the leading manufacturers listed above are especially proud today, to bring you units bearing the RLM Label. They know that, by keeping pace with latest industrial lighting advancements, RLM now stands for more lighting quality than ever.



R-202

Send for Free 1958 RLM Specifications Book. Write: RLM Standards Institute, Suite 829N, 326 W. Madison St., Chicago 6, Ill.

PLAN '59
MANAGED MODERNIZATION

To insure success for your newest okayed project—and to boost the odds that your future modernization proposals will get the green light—here are . . .

4 Tips for Your Follow-Through

THE CARTOONS at right show what you must do after your modernization proposal gets an okay. Why should you do anything? Because you can improve the chances of approval for future projects if this one goes well.

You can do four things to insure success for your okayed project:

1. STICK TO SCHEDULE

Effectiveness of a project may depend on getting it into operation on time. Installations that don't meet schedule may fail to fill the sales and advertising demand that has been built up, bring added costs because of idle inventory, throw the rest of your manufacturing plan out of whack. Following are 15 different kinds of delay—and a means of preventing each one:

• Delay 1—Work stoppage by installation crew.

. . . *Preventive:* Attend to minor grievances before they get major. Keep your ear to the ground for jurisdictional disputes.

• Delay 2—Changes in the design of components.

. . . *Preventive:* Hard-headed, no-change policy. Because one change leads to another, and another.

• Delay 3—Late delivery of critical components.

. . . *Preventive:* Don't soothe yourself with the thought, "That isn't scheduled for six months." Make regular checks of supplier progress starting when you place the order.

• Delay 4—Late delivery of minor standard items.

. . . *Preventive:* Make sure material clerks and expediters understand the special importance of meeting delivery schedules on your project.

• Delay 5—Personnel accidents.

. . . *Preventive:* Take time to teach —and work—safely.

• Delay 6—Unexpected structural problems.

. . . *Preventive:* Call the plant man who knows most about the building when you open a wall, the man who knows foundations when you dig a pit. Get expert appraisal of conditions when you start a major step.

• Delay 7—Breakdown of key installation equipment.

. . . *Preventive:* Figure on it, plan an alternate method in advance.

• Delay 8—Bad weather.

. . . *Preventive:* Base your initial planning on worse-than-average weather. Use local weather bureau figures, not your memory.

• Delay 9—Unexpected loss of skilled men to another job.

. . . *Preventive:* Get advance dope on other jobs planned in the area.

• Delay 10—Outside labor trouble, strikes.

. . . *Preventive:* Know when negotiations are scheduled for trades and industries that are essential to your project. Order and work ahead to avoid tie-up.

• Delay 11—Breakdown elsewhere that gets labor priority.

. . . *Preventive:* Put an allowance for this in your schedule. Also consider using outside shops to handle overloads.

• Delay 12—Legal problems, permits needed.

. . . *Preventive:* Review the project in detail with the guys in your legal department.

• Delay 13—More debugging than you allowed for.

. . . *Preventive:* Test components as they come in, make suppliers help.

• Delay 14—Errors in your planning, such as inadequate storage, no space for components, low bridges, interference with other facilities.

. . . *Preventive:* They're in every project. Best way to minimize them is to review plans weekly for work just ahead. Committee review helps.

• Delay 15—Execution errors, such as faulty materials, inadequate facilities, etc.

. . . *Preventive:* No way to get rid of these. Try brainstorming to find solutions to your critical problems as they arise.

By G. A. HOY and R. S. RICE
FACTORY

Four Steps to Insure Success for Your Project

1. Stick to your time schedule

2. Keep your money promises

3. Work with others

4. Prove out your results

2. HOLD TO BUDGET

Easiest thing to do (and the most deadly for your future proposals), is to let the project cost more than the estimate. If your mistakes are in the estimate there's not much you can do except be straightforward about them. It's better not to cut corners to stay within an unrealistic budget. Your chances of jeopardizing the payout of the project are too high. But you do have control over some things, even during the last days of project installation. Here are six items you should watch like an accountant—with dollar-colored glasses, that is:

• Money Headache 1—"Minor" changes to improve the project.

. . . *Cure:* Your best bet is to adopt a "no change" policy unless there's no added cost.

• Money Headache 2—Off-the-cuff remarks by visiting brass—board of directors, headquarters officials, etc.

. . . *Cure:* You should ignore "wouldn't it be nice if . . ." comments unless in writing. Most often the VIP is wondering out loud, really doesn't want an extra crane "just in case the other one breaks down."

• Money Headache 3—Continuing price increases.

. . . *Cure:* You can help your purchasing department stay ahead of price increases by getting your needs lined up well in advance.

• Money Headache 4—Substitution of materials, components.

. . . *Cure:* You should exhaust every possible source of supply before you decide to switch specifications at increased cost.

• Money Headache 5—Pilferage in the plant or office.

. . . *Cure:* You can provide extra protection if you need it. Plant police will be glad to help.

• Money Headache 6—Unauthorized use of your accounting number for other project costs.

. . . *Cure:* You might consider getting accounting to do a real audit job. But your own closet had better be clean of skeletons.

3. WORK WITH OTHERS

If you want your project to swing smoothly into effective operation, you'll need the help of just about every other department in the plant. Following is a list of those you can work with to mutual advantage:

. . . *Industrial engineering*—Must set standards, incentives, job rates, and the like.

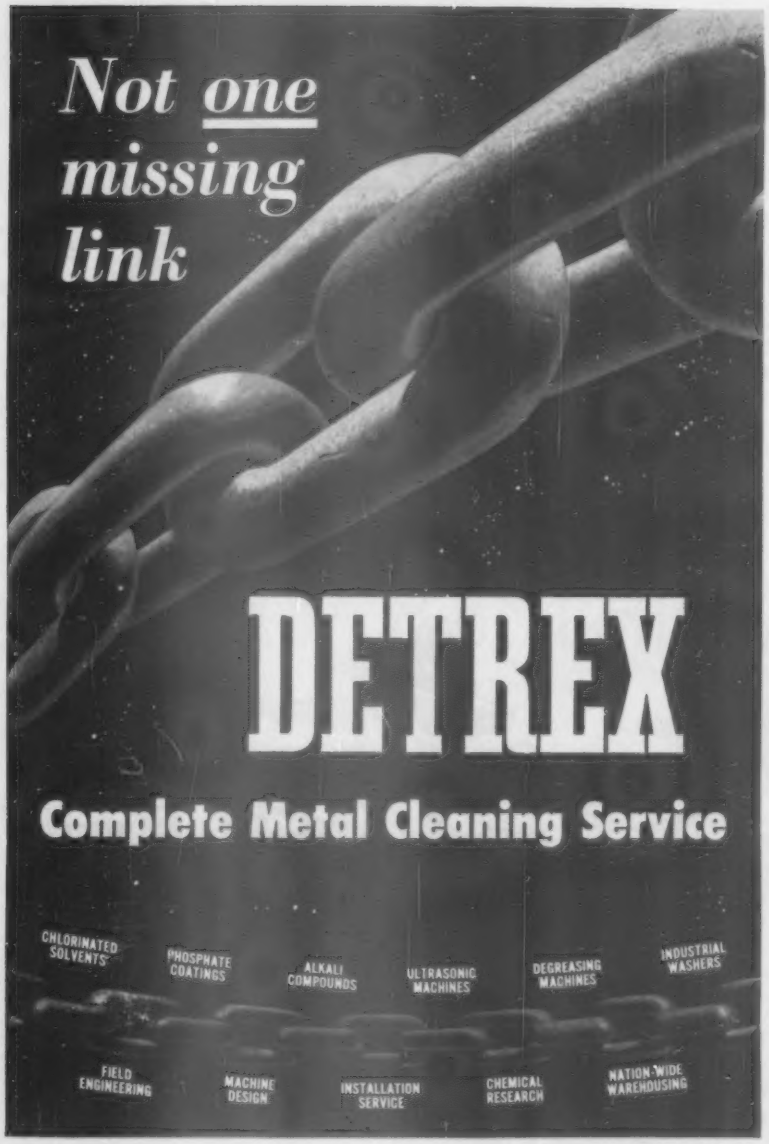
. . . *Production planning*—Must learn capabilities for scheduling.

. . . *Labor relations*—Should prepare union men for the change.

. . . *Product engineering*—Must do shop drawings in time for operation.

. . . *Training*—Can help supervisors and workers who will work with the new equipment.

Turn the page



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4 FOLLOW-THROUGH TIPS

Begins on page 216

. . . *Employment*—Should know personnel needs well in advance.
. . . *Maintenance*—Should set up a preventive maintenance schedule, train repair crews.
. . . *Safety*—Must check out the installation, approve its use.
. . . *Quality control*—Must set up procedures, get checking equipment.
. . . *Packaging, shipping*—May need new packaging plans.
. . . *Plant protection*—Should know what its responsibilities will be.
. . . *Sales*—Will be especially interested in any product change.
. . . *Public relations*—May be able to get a plug in local papers.
. . . *Legal department*—Can check insurance, unusual ordinances, etc.
. . . *Accounting*—Might need your help if bills are slow, mixed up.
. . . *Purchasing*—Can be one of your key allies if your approach is friendly rather than hostile.

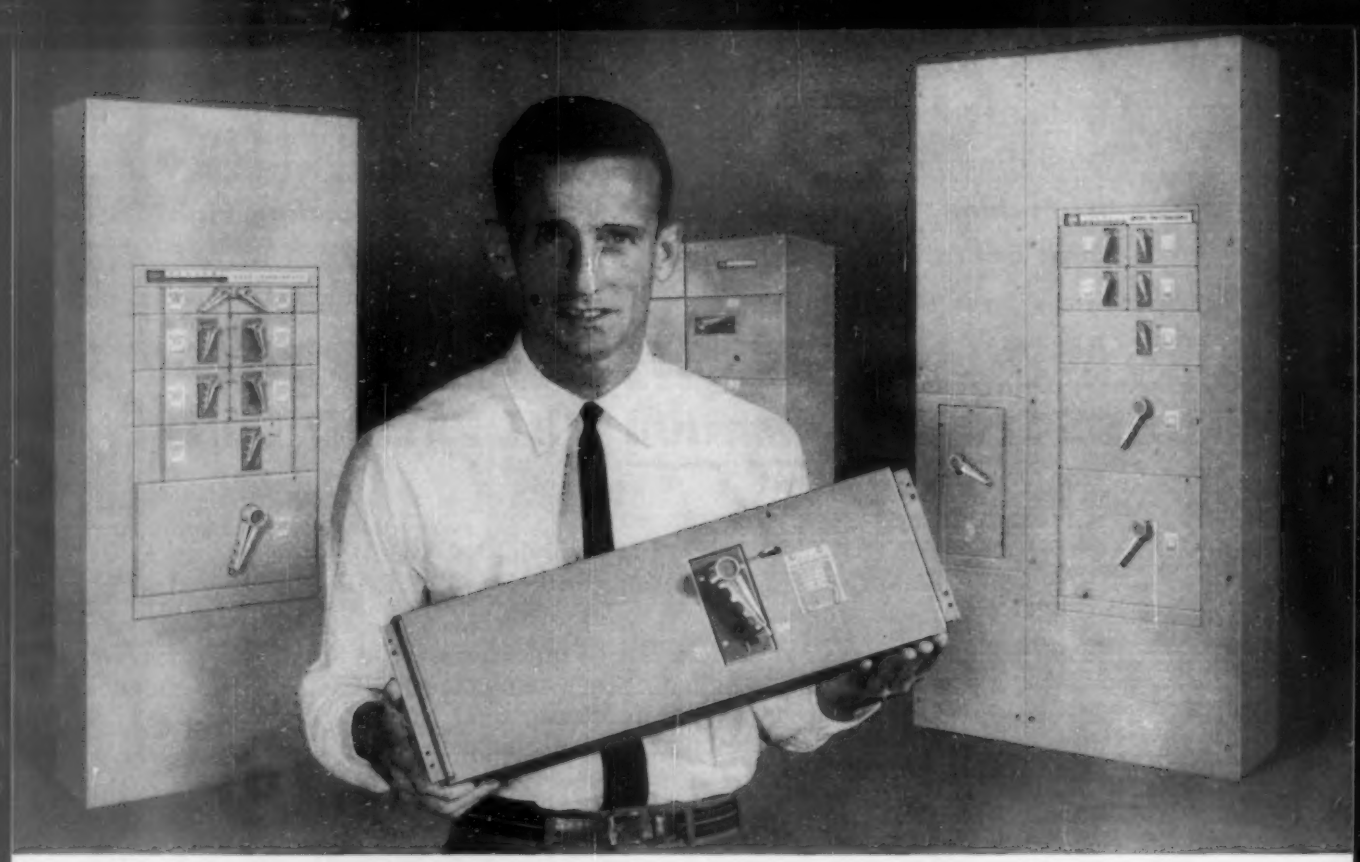
4. PROVE OUT THE PROJECT

After installation, the brass will be looking over your modernization shoulder. Formally or informally, they'll keep tabs on the money spent as a result of your recommendation. Maybe (as at one plant FACTORY editors visited) the chairman of the board, president, and vice president of production will visit your plant, check results. The manager of the above-mentioned plant refers to his visitors with the reverent analysis, "And they are sharp." This manager bears another cross: "In a small plant (less than 1000 employees) it's very difficult to kid the general manager—he's in too close touch with everything."

Or perhaps your controller's department will prepare an audit, as at General Aniline & Film Corporation, Dyestuffs & Chemicals Division (Linden, N. J.). There the follow-up study takes a form identical to that of the original request. Purpose is to highlight failures. And if the project is a failure, says Robert Caplin, chief cost accountant, "there's hell to pay."

Or your boss may evaluate your proposals as part of the over-all profit and loss statement. This is true in 20% of the plants FACTORY editors visited. But mana-

For more facts circle 585 on Reader Service Card
For more facts circle 586 on Reader Service Card ➤



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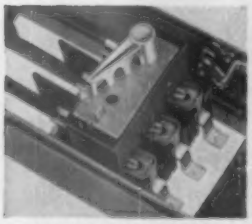
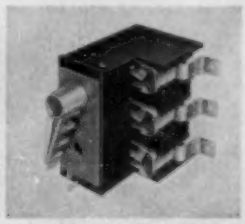
- **30 THROUGH 1200 AMPS**
- **VISIBLE BLADE CONSTRUCTION**

FOR PANELBOARDS, SWITCHBOARDS, CONTROL CENTERS—heavy-duty design meets modern industry's increased power handling requirements—30 through 1200 amperes, 600 volts—the most complete line available! U.L. approved. For complete information on QMQB units and panelboards, write for bulletin 3-230: Federal Pacific Electric Company, General Offices: Newark, New Jersey.



VISIBLE BLADES FOR MAXIMUM SAFETY—Lets you see at a glance whether switch is "ON" or "OFF"—makes inspection easy. Silver-alloy contacts insure positive connections—reduce wattage loss.



INTEGRAL HANDLE MECHANISM FOR GREATER CONVENIENCE—handle mechanism and switch are combined in a single unit—eliminates excess linkage—prevents misalignment and false indication of switch position.

DEIONIZING ARC QUENCHERS FOR COOLER, FASTER INTERRUPTION—eliminate pitting and provide higher interrupting ability. Arc is divided, cooled, and extinguished in the quencher, rather than on the contact surfaces.

HIGH PRESSURE FUSE HOLDERS FOR LONG LIFE, RELIABLE SERVICE—grip the fuses tightly under constant spring pressure—reducing contact resistance for cooler, more efficient switch operation—even under varying loads.

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Does operator fatigue influence product quality?

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DIVISION OF INTERNATIONAL BASIC ECONOMY CORPORATION
AKRON 9, OHIO

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4 FOLLOW-THROUGH TIPS
Begins on page 216

gers in these plants often feel a follow-up system is desirable. They recognize their lack of follow-up as a shortcoming, are looking for a system that will not require too much bookkeeping. Only a very few plants see no need for checking back on projects, and these are mostly fast-moving plants (such as aircraft and missile builders), where rapid-fire product changes make manufacturing arrangements obsolete before they've been completely de-bugged.

In any event, says one superintendent, "A man's reputation precedes him. If cost reduction doesn't materialize on a new installation or improvement, the climate for that man's future proposals becomes chilly." Asked how he keeps management sold on modernization, Vic Mills, general manager of manufacturing, Sherwin-Williams Company (Cleveland), says, "By making our proposals work. If we keep a good batting average, we're okay."

Seizing the offensive—Assuming you have a reasonable batting average of successful proposals, you can seize the offensive in this proof-of-the-pudding effort. Sure, you can let the paperwork boys in accounting come up with figures to support your original proposal. But they can't know all the details that can make or break a project review. M. E. Goetz, district manager, Republic Steel Corporation (Cleveland), uses this approach: "We have a follow-up (make-good) report after a piece of equipment has been operating six months. If we can show we've cut labor costs or fuel bills, or boosted tonnage, then we've vindicated our proposal. If the savings don't show up right away we keep at it until they do."

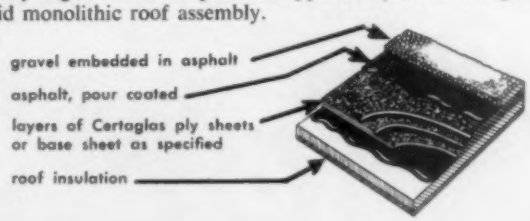
What's the key here for the operating manager? Control. Control of the make-good report, so temporary problems in production, quality, economy will be smoothed out when the make-good report gets to the president's desk. Chances of his drawing an unfavorable conclusion based on misinformation are small.

This doesn't mean you can phony a poor move. The profit and loss books will eventually catch you if you try. It does mean you can give

IF . . . .

. . . one of your many plant maintenance problems involves roofing then it will pay you to know more about Certain-teed's Certaglas Built-up Roofing and the many benefits you will receive from it:

• **MONOLITHIC CONSTRUCTION**
Certaglas is so porous that the hot asphalt penetrates it completely right down to previous-applied layers—forming one solid monolithic roof assembly.


gravel embedded in asphalt
asphalt, pour coated
layers of Certaglas ply sheets or base sheet as specified
roof insulation

• **SAVES MONEY**
Certaglas saves you money because it not only provides a roof that will give longer trouble-free service; but it helps save application time.

• **LONGER LASTING**
Certaglas is made of long lasting Fiberglas which cannot rot, cannot decay and will outlast the bitumen.

• **CUTS TIME AND SPACE**
Certaglas saves time by its easy application and fewer plys—saves space with more square feet per roll.

• **LIGHTER, EASIER TO APPLY**
Certaglas is applied the same way as regular roofing felts; but it's 60% lighter! Certaglas speeds up every job.

For more detailed information send the coupon below.

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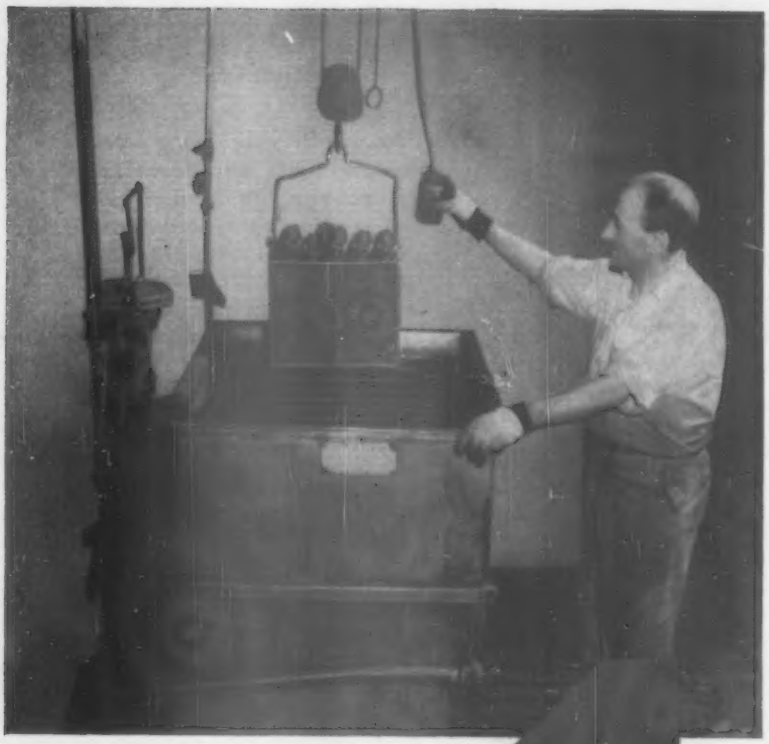


degreasing compounds last up to 4 TIMES LONGER with a PUROLATOR filter

You'll spend up to 60% less on degreasants when you filter them with a Purolator filter. The filter traps most of the contaminants, so the compound lasts up to 4 times longer. You just change the filter instead of changing the compound—much easier and much cheaper.

The compounds stay like new longer because the filter picks up the contaminants as soon as they appear, prevents them from cutting down on degreasing efficiency.

Original installation of the filter is simple, too. The motor and pump that circulate the degreasing fluid will also pump the compounds through the filter.

This is just one of the ways Purolator can help reduce operating costs and improve product quality. For further details contact your nearest Purolator Industrial Sales Agent, or the Purolator Industrial Sales Division, Rahway, N. J. Dept. PF 2-112.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

RAHWAY, NEW JERSEY AND TORONTO, ONTARIO, CANADA

4 FOLLOW-THROUGH TIPS

Begins on page 216

your projects the best possible break by assuming responsibility for proving them out. And if your figures absolutely prove you've made an error in judgment, you'll be able to let the information out yourself, in your own way, at the best time from your standpoint. (A good public relations man would say: "Wait for a day when the boss is in good humor, then come right out with it. Take the full blame. Don't alibi.")

When and how to audit—You need a schedule and a method for post-completion audits. Here's how five sample companies do it:

. . . *Quaker Oats Company* (Chicago) has a tickler file set-up to trigger review one year after installation. A request goes back to the originating group. A standard form is involved. After completion, the form goes to the engineering department for comments, then to the vice president of manufacturing.

. . . *American Machine & Foundry Company, Inc.* (Brooklyn) includes a make-good report with each year's capital expense budget. The report shows actual cost experience based on accounting figures.

. . . *The Louis Allis Company* (Milwaukee) uses a follow-up form that's completed three months after production begins with a new piece of equipment. Proof of savings figures must be approved by production foreman involved, production superintendent, and controller.

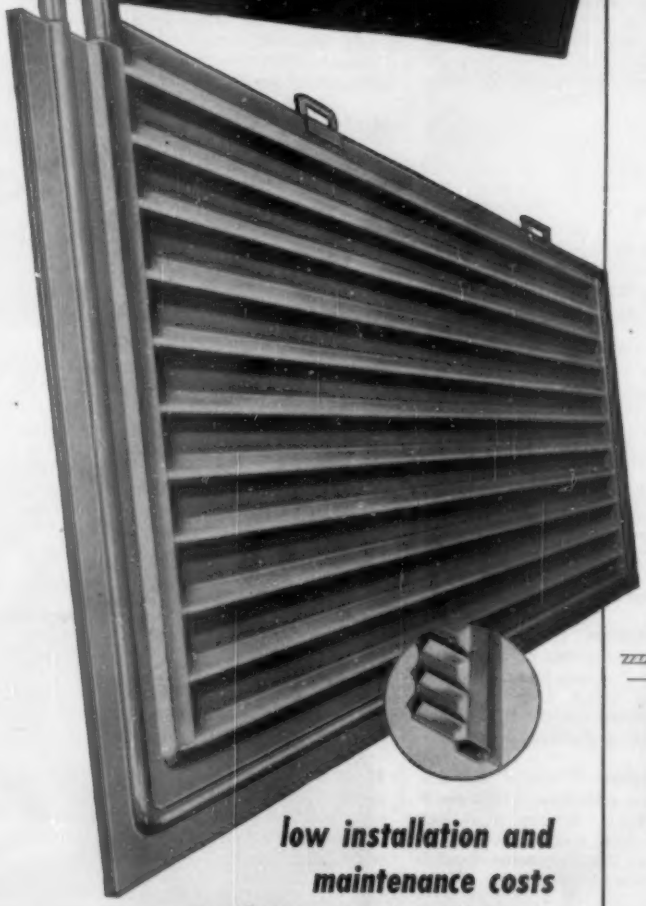
. . . *Hewitt-Robins Inc.* (Stamford, Conn.) proves out its projects after two to four years of operation. Actual expense is compared with anticipated savings.

. . . *Adamas Carbide Corporation* (Kenilworth, N. J.) uses two reports. A preliminary goes to top management as soon as project shows results. Final and complete report follows, when costs can be really pinned down to pennies. Plant Engineer Gerald Scheyer works until he can prove, for example, that cost per gram of grinding is as predicted.

. . . *Bell & Howell Company* (Chicago) rates the performance of a new piece of equipment as soon as it's installed satisfactorily. Cost reduction man assigned to project sticks with job until it meets performance promises. **END**

pipe coils are old fashioned...

modern
PLATECOIL®
cuts heating and
cooling costs



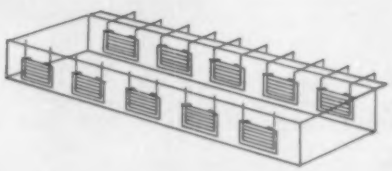
low installation and
maintenance costs
greater heat transfer efficiency
lower space requirements

Write for free Bulletin P-60 "HOW TO CUT HEAT TRANSFER COSTS WITH PLATECOIL" for complete information.

KAWNEER uses stainless steel PLATECOIL® units in acid anodizing tanks

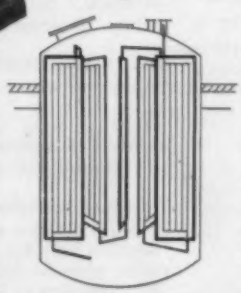
Ease of changing, cleaning and repair are among the advantages of PLATECOIL over pipe coils cited by the KAWNEER CO., Architectural Products Division at Niles, Michigan. Low installation costs, good maintenance and space savings over pipe coils plus heat transfer efficiency are advantages which this company has obtained by using PLATECOIL. The PLATECOIL units are used for heating in water seal, caustic and cleaner tanks; for cooling in anodize tanks.

The drawing shows the location of the PLATECOIL units in an acid anodizing tank.



SHELL CHEMICAL uses PLATECOIL® in synthetic rubber reactors

Stainless steel PLATECOIL units remove heat liberated in synthetic rubber polymerization reaction at the Torrance California plant of Shell Chemical Corporation.



High efficiency, low cost per unit surface, ease of cleaning and improved agitation are cited as benefits obtained through use of PLATECOIL in this application. The PLATECOIL units were fabricated into vertical banks as indicated in the sketch.

TRANTER MANUFACTURING INC.
LANSING 9, MICHIGAN

PLATECOIL®
DIVISION

For more facts circle 590 on Reader Service Card

CATALOG NEWS

For more about these items, circle numbers on Reader Service Card next to back cover.

PRODUCTION

1—Boring, Milling Machine. An illustrated 12-page catalog describes what is said to be first machine tool on which numerical control is offered as standard equipment. Manufactured in West Germany, sold here. *Marac Machinery Corp.*

2—Airless Spray Process. Here's a 4-pager that shows how this process reduces waste and health hazards. Sprays by straight hydraulic pressure which eliminates usual rebound of paint particles. *Bede International Development Co.*

3—Power Strap Feed Assembly. Catalog AD276 is an illustrated 8-pager that describes three models that feed steel strapping around large packages and units. Has specs, gives capacities, shows accessory equipment. *Acme Steel Co.*

4—Strapping Equipment. Here's a small-size 52-page catalog covering light and heavy flat steel strapping, oval and round steel strapping, pressure sensitive tape. Application photos, charts, and other info. *A. J. Gerrard & Co.*

5—Ultrasonic Cleaners. SonBlaster equipment ranging from 35-watt to 2.5-kw. systems, and related transducers in capacities from ⅜ to 75 gal. are described in 4-pager (No. 104). Lists various data. *The Narda Ultrasonics Corp.*

6—Crucibles for Metal Melting. This 12-page catalog (Form 1795) gives info on selecting the proper high purity refractory crucibles for metallurgical use. Describes physical and chemical characteristics, etc. *Norton Co.*

7—Drills. Illustrated catalog SC-110 is a 4-pager that discusses Starbore carbide gun drills that produce smooth, precision through-holes in cast iron, aluminum, bronze, and some steel parts. Other data. *Star Cutter Co.*

8—Tumblers. This 4-page bulletin (255) describes the Vibraslide as "a completely new principle of operation." Discusses installation features; photos show the product. *B. W. Elliott Mfg. Co.*

9—Power Presses. What to consider when selecting power presses is set forth in Bulletin WARCO52151 (20 pages). Includes fundamentals of press working of metals with sketches, tables, charts. *The Federal Machine & Welder Co.*

10—Resin Dispenser. "Meter, Mix and Dispense" is a 4-page brochure (TR-1) that describes pump for dispensing two-part resins. Contains info on design, operation, and means of automating the pump. *H. V. Hardman Co., Inc.*

11—Holding Devices. Three illustrated catalogs: No. 158 (28 pages) gives solutions to tool application problems of fast production vises. Forms 59 and 60 (4-pagers) describe screwless and air vises, with specs. *Heinrich Tools, Inc.*

12—Drills. Catalog SP-160 is a 32-pager, "You're On the Road to Better Drilling." Humorously illustrated, it shows how to obtain improved precision and economy in drilling operations. Has section for jotting down useful job info. *Cincinnati Lathe & Tool Co.*

MATERIALS

13—Steel Tubing. Here's a 60-page bound "Handbook of Cold Drawn Mechanical Steel Tubing" with info on its manufacture and uses. Includes metallurgical, mechanical, engineering data. 75 photos and drawings. *Pittsburgh Tube Co.*

14—Ebullient Cooling. This 24-page booklet (Form No. 164-79) compares conventional and ebullient systems and discusses properties, advantages, use of product. Has temperature, other curves, detailed index. *The Dow Chemical Co.*

15—Magnetic Rubber. Bulletin No. 58 (4 pages) describes flexible magnetic material that is resistant to oils and acids. Magnetic field is formed in any pattern or shape. In molded or sheet form. Photos. *Denman Rubber Mfg. Co.*

16—Urethane Rubber. This 4-page booklet presents characteristics of a polyurethane elastomer that acts like rubber and wears like tough metal. Can be cast or bonded; applications include tires, gears, etc. *Dunlop Tire & Rubber Co.*

17—Felt Insulation. Catalog No. IN-200A, a 6-pager, tells how a refractory-fiber felt insulation, a fraction of an inch thick, provides heat control to 2000 F. Has light weight, low "k" factor, flexibility. Photos. *Johns-Manville.*

18—Manufactured Graphite. Technical data on "family" of related materials will be available in a looseleaf handbook. This graphite info, plus periodic releases of new data are specifically for technical personnel. *National Carbon Co.*

19—Precast Concrete Panels. Here's a spiral-bound booklet with 12 pages of info on wall panels in either solid or insulated units. Method of erecting panel walls is said to cut construction time by weeks. *Marietta Concrete Corp.*

MECHANICAL

20—Shaft-Mounted Speed Reducers. Illustrated Catalog 2618 (24 pages) contains engineering and selection info on single reduction drives in six sizes, double reduction drives in seven sizes. Technical tables, diagrams. *Link-Belt Co.*

21—Shaft Seals. Here's a 4-page section (P.O.47190-2F) that describes mechanical shaft seals and roll neck seals. Data for maintenance free sealing of rotating shafts on pumps, compressors, turbines, engines, mixers, etc. *Syntron Co.*

22—Gear-Shift Drive. This 8-pager (OEM-DB) discusses construction and applications of gear-shift drives. Gives comparative data between company's "selective speed" drives and other types. Photos. *The Lima Electric Motor Co., Inc.*

23—Mechanical Seals. Illustrated bulletin (AD-164) lists types, design, specs of corrosion-resistant mechanical seals. Combine best properties of Teflon with dependable features of bellows design. Other products are also covered. *The Garlock Packing Co.*

MATERIALS HANDLING

24—Hoists, Cranes. "Building Blocks for the Crane Industry" is a 64-page manual that illustrates and describes equipment for assembly of custom-engineered cranes from standardized components. *Consolidated Crane & Engineering Corp.*

25—Fork Trucks. Bulletins 607 and 608 are 4-pagers that give operating and design specs for 3000-lb. and 4000-lb. capacity electric-powered trucks. Dimensions info, turning diagrams, operating photos. *Elwell-Parker Electric Co.*

26—Vibrating Feeders. Illustrated 30-page catalog (P.O.47190-2C) discusses standard and special model electromag-

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OTHER CATALOGS

Instruments and Controls .....p. 226
Valves, Pipes, and Fittings .....p. 228
Electrical .....p. 228
Heating, Ventilating, and Air Conditioning .....p. 230
Auxiliary .....p. 233
Maintenance .....p. 233
Miscellaneous .....p. 234

People
buy
Scott Towels
for
many
reasons:

Mr. Herbert J. Kreiling, Auditor, Scripps-Howard Pittsburgh Press, says:

"Scripps-Howard people know paper . . . they like the quality that goes into every Scott Towel"

"Sure, you can quote me," says Mr. Kreiling. "Not long ago we at The Press switched to Scott Towels. I knew other Scripps-Howard papers were using them—and thought we'd give them a try. Here are the stories that came back to me . . . 'Now *there's* a paper towel that dries!' . . . 'As clean-looking as a fresh roll of newsprint!' As for myself, I find it a lot easier to do business with a reputable firm like Scott."

SCOTT PAPER

Your Scott distributor is in the Yellow Pages under "Paper Towels." Call him today. And be sure to watch "Father Knows Best" on CBS-TV.

Scott UHA Towels **Scott Multifold Towels**
Scott Singlefold Towels **ScotTissue**

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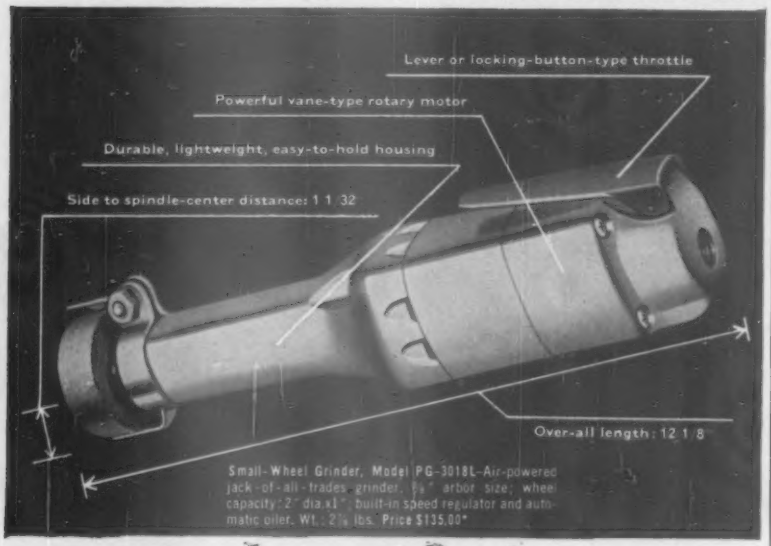
POWER to boost job efficiency with REMINGTON tools


Lever or locking-button-type throttle
Powerful vane-type rotary motor
Durable, lightweight, easy-to-hold housing
Side to spindle-center distance: 1 1/32
Over-all length: 12 1/8

Small-Wheel Grinder, Model PG-3018L—Air-powered jack-of-all-trades grinder, 5/8" arbor size; wheel capacity: 2" dia.x1"; built-in speed regulator and automatic oiler. Wt.: 2¼ lbs. Price $135.00*

Drill, Model 381—⅜" capacity; compact; 2.5, 115-volt motor; free speed: 800 amp; full ball-bearing, construction and precision-cut gears. Price $59.00*

Flexible-Shaft Machine, Model 8FGP—3-hp, totally enclosed dust- and vapor-proof induction motor geared for 4,500 rpm; 220/440 volts; sealed ball bearings. Price $370.00*

Circular Saw, Model 186—10" blade; super-duty, super-torque worm drive; 13-amp. motor; 3,500 rpm; rugged, lightweight: 20 lbs. Price $195.00*

Remington delivers power, mobility and easy handling to help you cut costly man-hours on the tough jobs. Remington Power Tools are designed and built for extra-long service with minimum maintenance. Your Remington distributor stocks and services the industry's widest selection of power tools and parts.

Sander, Model 57S—7" discs, quick-change spindle lock; free speed 4,500 rpm; heavy-duty ball bearings; 10 amps; wt.: 14 lbs. Price $88.00*

Mechanics Maintenance Kit, Model MM-43—Air-powered (Model MM-40: electric-powered) impact wrench with multi-purpose accessories. Price $395.50*

CHOOSE THE POWER MOST EFFICIENT FOR YOU. REMINGTON POWER TOOLS ARE AVAILABLE IN **AIR • ELECTRIC • GASOLINE-DRIVEN MODELS**

FREE CATALOG

Send for free catalog describing the complete line of Remington Contractor and Industrial Tools. Also available: folder describing Mechanics Maintenance Kits with examples of savings. Mail the coupon.

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FACTORY / CATALOG NEWS

Begins on page 224

For more about these items, circle item numbers on Reader Service Card next to back cover.

netic feeders for hard-to-handle bulk materials. Shows typical installations, application diagrams. *Syntron Co.*

27—Conveyor Control. This 4-page catalog (Form A-958) covers operation and application of new "Asset" unit. Automatic selected station electronic timer "memorizes" and executes orders. Includes photos, diagrams. *A. J. Bayer Co.*

28—Hand-Operated Cranes. Operating and capacity details of Type B-36 underslung single bridge crane are described in Bulletin DH455-B (4 pages). Installation and other technical data, diagrams. *American Chain & Cable Co., Inc.*

29—Electronic Tractor. Bulletin 586 (4 pages) tells about Guide-O-Matic tractor that tows trucks over predetermined routes without operator. Photos show applications. *Barrett-Cravens Co.*

INSTRUMENTS AND CONTROLS

30—Standard Controls. Here's a humorously illustrated 4-pager bulletin about company's new catalog No. C-101-1 that covers over 9000 devices for control, switching, or safety functions. *Minneapolis-Honeywell Regulator Co.*

31—Instrumentation Recorders. Characteristics and operating features of instrumentation tape recorders and reproducers are covered in 4-page brochure. Includes specs of new transistorized recording system. *Minnesota Mining & Mfg. Co.*

32—Sealing Glands, Assemblies. This 36-page catalog (No. 1885) illustrates and describes additions to company's thermocouple assemblies and pressure sealing glands. Includes assembly instructions, temperature curve. *Conax Corp.*

33—Flow Switches. Bulletin FS-1 is a 4-pager that gives details of construction, dimensions, ratings on various models. Switches respond to flow of liquid in a pipeline to make or break a circuit. *McDonnell & Miller, Inc.*

34—Photo-Electric Controls. "Proved Answers to Successful Automation" is a 24-page illustrated brochure (PA561). Drawings show applications of systems; contains specs, selector guide, other data. *Electronics Corp. of America.*

35—Pressure Transducers. Here's a 4-pager (Bulletin Series PSG1) that describes instruments for gage, absolute and differential pressure measurement. Tells how they work. Performance and other info. *Gulton Industries, Inc.*

Turn the page

ARE YOU GETTING SHORT CHANGED ON YOUR SHIPPING DOLLAR?

Some airfreight and truck carriers today advertise so-called "bargain" rates which actually impose *higher* minimum weight charges and mean *less* service. Be sure you compare Railway Express rates *and service* before you ship with any other carrier.

Here are down-to-earth facts on Railway Express Service

WIDEST COVERAGE—Railway Express serves some 23,000 communities to give you mass distribution—with *one company responsibility*. You reach *every* major market in the U.S., and with Railway Express International Service, most every major market abroad. No more worries about delays and divided responsibility in transfers between two or more carriers.

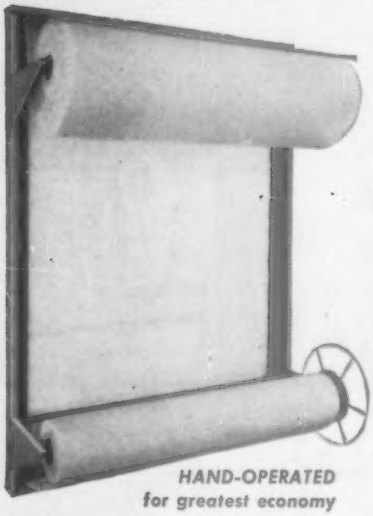
SPECIAL LOW RATES—You get door-to-door delivery, at no additional cost within REA vehicle limits in U. S. A. And Railway Express offers special low commodity rates on ready-to-wear merchandise, graphic arts materials, hosiery, shoes, drugs, import-export traffic and many other categories. Call your nearest Railway Express Agent.

OUTMODED

BY NEW

CONOMANUAL

AIR FILTERS



HAND-OPERATED
for greatest economy

Low Cost and Minimum Attention.

CONOMANUAL is designed especially for installation where cost limitations prevent consideration of automatic equipment, but where the convenience, economy, and cleanliness of a roll-away, dry-type disposable-media filter is desired. Its reinforced synthetic media winds dirty-side-in after use—is easily removed without dirt, grease, or unpleasant "shedding" problems.

Contact your nearest CONTINENTAL Representative or mail coupon below for Bulletin No. 850 for complete details.

CONTINENTAL AIR FILTERS

CONTINENTAL
AIR FILTER, INC.
2520 Helm Street, Louisville 8, Kentucky

Please send me Bulletin #850.

NAME_____

ADDRESS_____

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FACTORY / CATALOG NEWS

Begins on page 224

For more about these items, circle item numbers on Reader Service Card next to back cover.

36—Rotameters. Bulletin 18-B is a 4-pager that presents info on these instruments for measuring fluid rate of flow in pipelines 2-in. in diameter and larger. Application diagrams, capacity data table, graphs. *Schutte & Koerting Co.*

37—Process Instrumentation. Bulletin 100-R5 (8 pages) covers flow tubes, telemetering, valves, positioners, metals, and other devices. Includes operational data, design feature descriptions of products, photos. *B-I-F Industries, Inc.*

VALVES, PIPES AND FITTINGS

38—Service Regulators. Newly revised 20-pager (No. 1026, Rev. 3) describes three regulators—Nos. 107, 143, 173—for domestic gas service. Includes performance curves, capacity and dimensional tables, photos. *Rockwell Mfg. Co.*

39—Pipe and Fittings. Selection and application of polyvinyl chloride pipe, tubing, and fittings are discussed in 16-page manual (PVC-100). Covers normal and high impact PVC pipe for process fluids, waste. *Carlon Products Co.*

40—Compression Packings. Catalog 2-278 (24 pages) describes new addition to line of molded hydraulic packings and fluid. Available on roll or as pre-cut gaskets in natural and synthetic rubbers, other materials. *E. F. Houghton & Co.*

41—Forged Steel Unions. Looseleaf-style, 16-page catalog presents information and specs on unions and fittings. Covers various unions, check valves and fittings ranging from 2000 lb. through 6000 lb. cwp. *Clayton, Mark & Co.*

42—Internal, External Pump. Illustrated 3-color, 4-page catalog describes operation of a variable displacement internal-external pump. Lists advantages and suggested applications; has schematic drawings. *Borg-Warner Corp.*

ELECTRICAL

43—Circuit Breakers. Illustrated 56-page Speedfax catalog discusses molded case and large air circuit breakers, switchgear products. Application sections have tables; charts of sizes, ratings; diagrams. *I-T-E Circuit Breaker Co.*

44—Motor Control Centers. Bulletin GEA4979 (12 pages) describes control centers in NEMA sizes 1 to 6. Can be used where two or more a-c and/or d-c motors are controlled from central location. Charts, photos. *General Electric Co.*

Turn the page

Costly 20-gallon-per-minute water leak stopped

BEFORE

AFTER

Waterplug stops running water instantly

Here is what Underwater Services, Valley Station, Ky., had to say about Waterplug

STANDARD DRY WALL PRODUCTS CO.
Box X
New Eagle, Penna.
Gentlemen:
On October 6, 1957, our Underwater Services Company was called upon to repair a major break in an underwater drainage system for the Hardin County Sportsmen's Lake at Elizabethtown, Kentucky. Upon diving to the bottom of the lake we discovered several large ruptures in the 24" tiles used in the drainage system. Water, uncontrolled, was pouring through these breaks at a minimum approximate rate of 20 gallons per minute. Using underwater diving equipment we managed to reduce this torrent by packing sandbags into the holes channeled through the four feet of earth covering these tiles. Descending through a water control tower, we gained access to the interior of the drainage tiles to the area of breakthrough. Above us were four feet of lake bottom and 30 feet of water above that. Under these extremely adverse conditions we used the Thoro System WATERPLUG Cement to repair the breaks from the interior of the tiles.
Because of the simplicity and ease of mixing and applying WATERPLUG Cement, we were able to completely and effectively repair these breaks in the drainage system.
We were delighted with the effectiveness of WATERPLUG Cement in successfully overcoming this difficult water problem. Feel confident that in future underwater repair problems, our company will rely upon WATERPLUG Cement.
Very truly yours,
MICHAEL CALE,
Manager.

WRITE FOR BROCHURE
"HOW TO DO IT"

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NEW EAGLE, PA. • CENTERVILLE, IND.

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SAFER HANDLING

of INDUSTRIAL LIQUIDS!

Eliminate in-plant accidents caused by slick floors and spilled inflammables! This TOKHEIM Hand Pump, for use on drums or skid-tanks, has 8′ hose—or spout outlet—prevents dangerous, wasteful slopping of oils and many other liquids. Speeds production. Pumps 20 gallons per 100 strokes. Ask your dealer, your Tokheim representative or write for list of liquids.

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General Products Division

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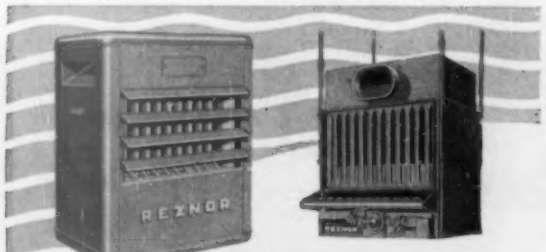


save floor space

Up out of the way of men and machines, Reznor suspended gas heaters waste no valuable floor space. The space they occupy is space you couldn't use for any other purpose.

You can eliminate many crowding problems by getting your heating equipment up and out of the way. Use Reznor suspended unit heaters for efficient, economical area heating or Reznor gas-fired duct furnaces for a flexible central heating installation. Whichever system will best fit your needs, your Reznor distributor can help you work out the details . . . and he can supply the necessary Reznor equipment out of his warehouse stock. For complete details just give him a call or write for your copy of "Modern Heating".

Look for Reznor under "Heaters-Unit" in the Yellow Pages

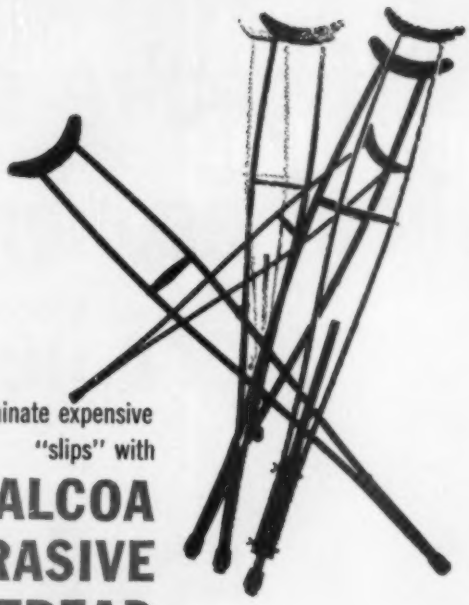
REZNOR

WORLD'S LARGEST-SELLING DIRECT-FIRED

UNIT HEATERS

Reznor Manufacturing Company, 89 Union Street, Mercer, Pa.

For more facts circle 597 on Reader Service Card



Eliminate expensive "slips" with

ALCOA ABRASIVE TREAD PLATE

An employee slips on greasy metal flooring, injures his back. Medical costs run up to $523.77. Workmen's Compensation is $1,313.30. Additional claims may be as much as $2,000 more. The employer's accident rate is up and production is down while another worker is trained.

This is just one of the 20,000 expensive slipping accidents which kill or injure industrial workers each year. Most of them can be prevented. Alcoa® Aluminum Abrasive Tread Plate remains slip-proof even when wet, oily or greasy. Made of tough particles of fused aluminum oxide, its hard, abrasive surface is the only non-skid floor plate that gives you the advantages of lightweight, corrosion-resistant aluminum.

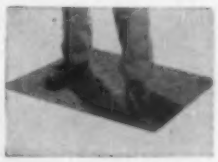
For more information on how you can eliminate hazardous conditions from floors, stairs, ramps and other areas, check the coupon below; write Aluminum Company of America, 1667-K Alcoa Building, Pittsburgh 19, Pa., or call your nearest Alcoa distributor.

Make Your Own 30-Second Safety Test . . . Send the Coupon for FREE Sample of Alcoa Abrasive Tread Plate.

ALCOA ALUMINUM

Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings



Sure-grip Alcoa Abrasive Tread Plate is the best insurance you can buy against slipping accidents.

Aluminum Company of America
1667-L Alcoa Building, Pittsburgh 19, Pa.

I'd like to see how Alcoa Abrasive Tread Plate prevents slipping. Please send me FREE sample—also application, design and fabricating data.

Name and Title.....

Address.....

City and State.....

For more facts circle 598 on Reader Service Card

If you're serious about economizing, start here

● This company eliminated the typical messy condition at left and saved $4,000 annually on maintenance by switching from powdered soap to SBS-60 Cream Deodorant soap. (Above photos both taken immediately after shift change.)

Waste soap is not the only needless expense in washrooms. Waste *maintenance* is even more costly. The company in the picture at right above saved some $4,000 a year in maintenance men's time by switching to SBS-60, the cream-type cleanser. How did SBS-60 accomplish this? Easy! One SBS-60 dispenser replaces six or more conventional powdered-soap dispensers. And the SBS-60 dispenser need be filled as little as once every three days, opposed to as often as three times daily for powders. In addition to all this maintenance time saved, of course, there is the tremendous saving in soap itself, for SBS-60 is almost impossible to waste. If you really want to cut costs, start by investigating this new concept in cleansing economy: SBS-60 Cream Deodorant soap! Write for details to dept. 58-K 1.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N. J.
CANADA: Chemical By-Products, Ltd., Rexdale, Ontario

FACTORY/CATALOG NEWS

Begins on page 224

For more about these items, circle item numbers on Reader Service Card next to back cover.

45—Aluminum Rigid Conduit. This 12-pager (Form 17-10283) discusses the non-toxic, corrosion-resistant, non-staining and non-magnetic features of this conduit. Added feature: color coded thread protectors. *Aluminum Co. of America.*

46—Generator Set. Here's a 6-pager (BU-412) that gives highlights of design, engineering and construction features of Model G-226—a portable, lightweight, packaged unit. Sketches show in-use application. *Allis-Chalmers Mfg. Co.*

47—Metal-Clad Switchgear. Operation, characteristics and application of indoor and outdoor switchgear are presented in Bulletin GEA-5664E (40 pages). Includes photos, dimensional drawings, lists of equipment. *General Electric Co.*

48—Rectifier Power Units. Catalog P.O.-47190-2H contains descriptions and specifications for selenium or silicon standard 3-phase, single-phase, and special low-voltage units. Shows battery chargers, other equipment. *Syntron Co.*

49—Duct Systems. These four pages (Form No. 599) describe system for installing surface-mounted communication and power wiring, each in own raceway. Discusses two most commonly used systems. Photos. *The Wiremold Co.*

50—Automator Units. A three-element unit to provide d-c variable speed drive from an a-c network is shown in Bulletin SB-183 (4 pages). Units are pre-assembled. *Marathon Electric Mfg. Corp.*

51—Switches. Here's a 32-page catalog (Form 5208) that presents info on many basic switches and actuators. Has photos and diagrams for each switch and other technical data. Includes "dictionary" of terms. *Illinois Tool Works.*

VENTILATING AND AIR CONDITIONING

52—Air Moving Units. This 16-page bulletin (No. 5412) describes over 50 special packaged designs. Has info on centrifugal blowers; vaneaxial, tubeaxial, and propeller fans; other blowers, coolers. Specs, photos. *American-Standard.*

53—Automatic Controls. Catalog No. 26 (52 pages) discusses controls for heating, ventilating, air conditioning systems. Covers thermostats, motor-operated valves, control centers, etc. Two smaller catalogs cover other automatic controls. *Barber-Colman Co.*

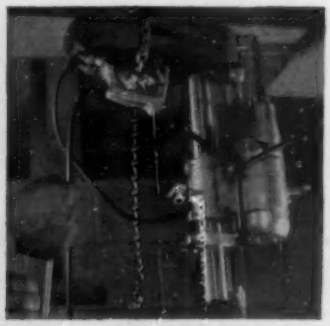
54—Tubeaxial Fans. Fans featuring "in-line" installation, universal mounting, long life bearings, etc. are covered in

For more facts circle 599 on Reader Service Card

For more facts circle 600 on Reader Service Card ➤

There's a Black & Decker Drill powered for every job!

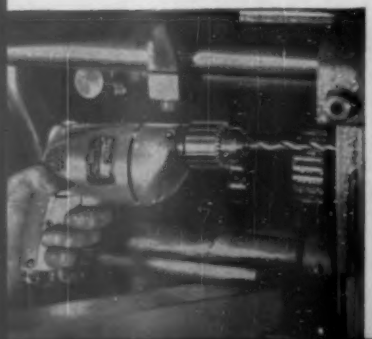
LITTLE SHORTY's the drill you want for those hard-to-get-to, around-corner jobs. Gets in tight spots! Excellent for small unit assembly.



DRILLS UPSIDE DOWN! B&D Magnetic Drill Press sticks to the wall like a fly; operates manually or with exclusive remote control.

TREMENDOUS TORQUE for the tough jobs. ¾" H.D. Holgun® is geared and powered to take on the hard ones. Compact to work in close quarters.

MOST POWERFUL drill of its size available, the ¾" Standard! A rugged tool with plenty of zip in reserve. Fully reversible; positive drive chuck.



71% of purchasing agents say make mine Black & Decker!

A recent industrial publishing company survey reveals that when purchasing agents need electric tools most think first of Black & Decker! One reason why: 33 *different* drills each designed to give you the power you need *plus* easy handling and long, troublefree life!

If you have a drill problem—a small hole in trim to a large hole up among the structural steel—be sure to see Black & Decker. Better still, mail the coupon for a free demonstration of our drill line. THE BLACK & DECKER MFG. CO., Dept. 0711, Towson 4, Maryland. (In Canada: Brockville, Ontario).

Leading Distributors Everywhere Sell

Look Under "TOOLS-ELECTRIC" in Yellow Pages

Black & Decker®

Quality Electric Tools . . . Power-built for top performance

MAIL COUPON FOR FREE DEMONSTRATION

THE BLACK & DECKER MFG. CO., Dept. 0711, Towson 4, Md.

- ☐ Please arrange for a demonstration of the following drill(s) .....
- ☐ Please send me additional information.

Name..... Title .....

Company.....

Address.....

City..... Zone..... State.....

REDUCE YOUR
REFUSE DISPOSAL COSTS
With These Low-Investment Systems

THE DEMPSTER-DUMPSTER

THE DEMPSTER-DUMPMASTER

THE DEMPSTER
COMPACTION TRAILER

THE DEMPSTER-DINOSAUR

America's Most Complete Line of Refuse Disposal Systems

The big savings in refuse disposal are made with mechanized, containerized, collection equipment. Dempster Brothers, the pioneer manufacturer of containerization equipment, now offers four efficient systems to help you increase your efficiency and decrease costs.

The DEMPSTER-DUMPSTER handles containers up to 15 cu. yds. The DEMPSTER-DUMPMASTER, available in three sizes, picks up and empties containers from one through six cu. yd. capacity. Compaction bodies are 18, 24 and 30 cubic yards with capacities up to 120 cubic yards of loose refuse. The DEMPSTER Compaction Trailer will hold and haul over 200 cubic yards of loose material per trip and it can be loaded by the DEMPSTER-DUMPSTER GRD-304-F-2. The DEMPSTER-DINOSAUR offers giant containers up to 40 cu. yds. and over. Write today for complete information.

Mfd. By DEMPSTER BROTHERS INC.
the originator and only manufacturer of the DEMPSTER-DUMPSTER Systems

DEMPSTER DUMPSTER® SYSTEMS

Dept. FM-11 DEMPSTER BROTHERS - Knoxville 17, Tennessee

For more facts circle 601 on Reader Service Card

For more about these items, circle item numbers on Reader Service Card next to back cover.

Catalog No. 1110-B, 8 pages. Charts give stack sizes, maximum horsepower, etc. *Westinghouse Electric Corp.*

55—Roof, Sidewall Ventilators. Direct-driven and belt-driven centrifugal fan models are described in 34-page Catalog V-58. Contains engineering drawings, performance graphs. *Carnes Corp.*

56—Cooling Coils. Here's a 52-page bulletin (No. 880) that gives complete coil selection info. Describes direct expansion coils, standard and cleanable tube water coils. Has specs, other data. *American Air Filter Co., Inc.*

AUXILIARY

57—Filters. "A new Concept of Electroplating Filtration" is a 4-pager (GEO-508) that tells how filters, with honeycomb filter tubes, provide tank turnover up to 3 times per hour. Other data; photos. *Commercial Filters Corp.*

58—Pumps, Conveyors. This 12-page bulletin (G-3B) discusses applications and performance characteristics of pumps, pneumatic and fluidizing conveyors, rotary compressors, other products. *Fuller Co.*

59—Dust Collector. Here's a 12-page bulletin (J616) that describes wet inertial type dust collector installed as part of the duct. It's one-tenth the size of other collectors of comparable performance. Drawings, photos. *Joy Mfg. Co.*

60—Centrifugal Pumps. Bulletin 721-6 (16 pages) discusses single-stage double-suction centrifugal pumps with horizontally split cases. Pumps available in all sizes with oil lubricated bearings. Photos, charts. *Goulds Pumps, Inc.*

MAINTENANCE

61—Pipe Insulation. Advantages of new lightweight glass fiber insulation are listed in 8-pager (Form WPN-2). Gives physical properties, thermal conductivity, and specs for application and finishing. *L. O. F. Glass Fibers Co.*

62—Treatment for Rust. This 4-pager (Form No. 15) describes product that stops rust action, prepares rusted metal for paint. Not a primer or paint—imparts slight etch to metal. *Rusticide Products Co.*

63—Heaters and Devices. Answers for hundreds of heating problems are given in this 52-page booklet (GEC-1005J). Includes new product info on pipe and other heaters. Specs, application index, other data. *General Electric Co.*

Turn the page

Improve factory SAFETY with
SHATTERPROOF RESOLITE
in monitors, skylights and windows

Saving just *one* lost time accident due to falling glass will pay for a lot of Resolite SAFE fiberglass glazing panes! And in maintenance costs, pane replacement labor is the big item — the cost of the panes themselves are negligible.

So, you save all around with Resolite Fiberglass Safety Panes. Once they're installed, they'll last virtually as long as the sash. The resulting savings in safety and maintenance add up — year after year!

Safety-glaze NOW before winter weather sets in!

BETTER LIGHT, TOO!
The glass fibers in Resolite act like millions of small lenses, diffusing the daylight to provide more "horizontal light", more effective interior light distribution.

FIRE RETARDANT PANES
In addition to the standard Resolite polyester resin formulation, where desired, panes are supplied in fire-retardant FIRE-SNUF® formulation, Underwriter's Laboratories labeled and Factory Mutual approved.

Clip and mail this coupon for complete information, specifications and installation details.

RESOLITE CORPORATION ZELIENOPLE, PA.

Chicago • Atlanta • Houston • Toronto

Resolite Corporation
Zelienople, Pa.

Please send me, without obligation, Bulletin 586, with complete information about factory glazing with Resolite fiberglass panes.

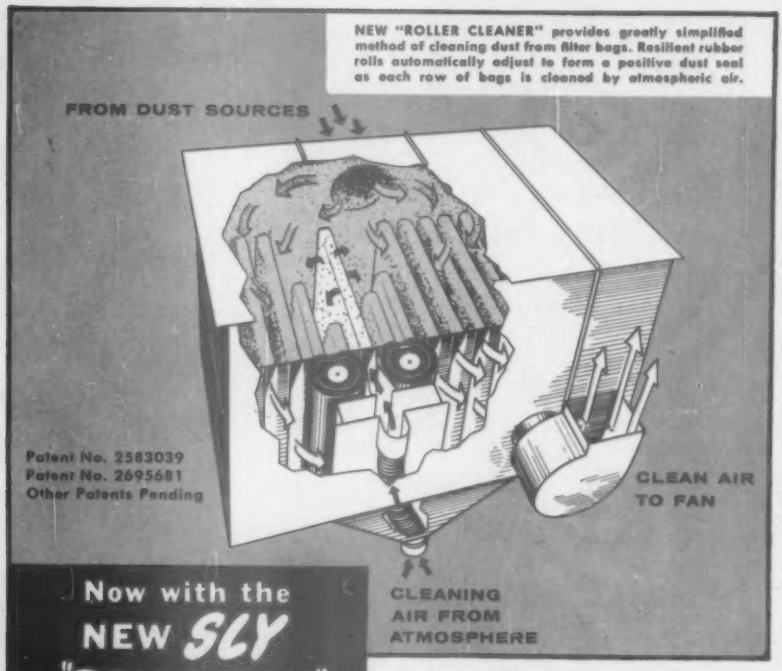
Name.....

Company.....

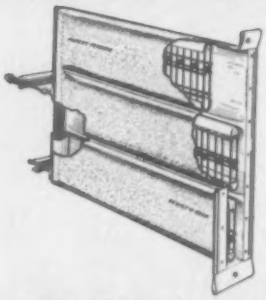
Address.....

City.....Zone.....State.....

FMM


NEW "ROLLER CLEANER" provides greatly simplified method of cleaning dust from filter bags. Resilient rubber rolls automatically adjust to form a positive dust seal as each row of bags is cleaned by atmospheric air.
FROM DUST SOURCES
Patent No. 2583039
Patent No. 2695681
Other Patents Pending
CLEAN AIR TO FAN
CLEANING AIR FROM ATMOSPHERE

Now with the NEW SLY "ROLL-CLEAN" DYNACLONE



As much as 3 TIMES LONGER BAG LIFE

NEW SLY "RESIST-O-WEAR" FILTER BAGS (patent pending) provide complete dust filtration with as much as three times longer life than conventional bags. This has been proved on the toughest field installations.

The new bag has three equal-size sections. Each pocket has two spacers, making a total of six per bag. Weight is distributed on three seams rather than one, minimizing strain. A special protective flap on the back end prevents abrasion from incoming dust.

Now standard in the new "Roll-Clean" Dynaclone, Sly "Resist-O-Wear" bags combine with all the other superior Dynaclone features to assure greatest dust collecting efficiency with unequalled maintenance-free service.

ALL THESE FEATURES IN ONE DUST FILTER

- New "Resist-O-Wear" bags last as much as three times longer.
- Constant suction at dust sources—complete dust collection.
- Automatically self-cleaning for continuous operation.
- Free-rolling cleaner. Complete dust seal—automatic seal adjustment.
- Greater filtering capacity; smaller space requirements.
- Simplified construction for ease of inspection and servicing.

SEND FOR New Bulletin 105 and New 36-page Dust Control Catalog 104.

SINCE 1874 SLY

THE W. W. SLY MANUFACTURING CO.

4755 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

FACTORY / CATALOG NEWS

Begins on page 224

For more about these items, circle item numbers on Reader Service Card next to back cover.

64—Lubricants. This 6-page foldout bulletin (CFT-58) explains lubrication of construction and other heavy-duty equipment with special multi-purpose grease. Has table of application recommendations. *Fiske Brothers Refining Co.*

65—Trestles, Scaffold Accessories. Catalog MR (8 pages) is a revised edition that illustrates and describes adjustable steel trestles and accessories such as ladder jacks and hooks, brackets, etc. *The Patent Scaffolding Co., Inc.*

66—Gas Appliances. Torch stems, torch handles, regulators, melting furnace, and other products are described in catalog F-1165—a 6-pager. Gives construction details and application data; drawing and photographs. *Linde Co.*

MISCELLANEOUS

67—Dermatitis Prevention Rules. Epoxy dermatitis and 36 rules for its prevention are listed in small 12-page booklet. Recommendations are based on experiences of epoxy fabricators, suppliers, public health agencies. *Milburn Co.*

68—Weed, Brush Killers. Here's a small 12-page ready-reference guide for effective and economical weed and brush control. Includes wide range of applications; gives formulations best suited to various control needs. *Diamond Alkali Co.*

69—Sterilization. Illustrated booklet (12 pages) explains company's long-range program for more efficient and economical sterilization as an integral part of product processing. Discusses facilities and services. *Wilmot Castle Co.*

70—Nuclear Reactor. This 8-pager describes development of the controlled recirculation boiling water reactor with nuclear heater. Atomic power plant is considering its use instead of fuel-fired super-heater. *Allis-Chalmers Mfg. Co.*

71—Equipment Leasing. Here's a 20-page brochure that analyzes the advantages of equipment leasing and includes case histories. Gives extensive technical data in chart form; has other statistical info. *United States Leasing Corp.*

72—Uniforms. This pocket-size 20-page catalog (No. 658) gives a "do-it-yourself acid test" for durability of uniform material. Cloth in jackets and trousers comes in six dyefast colors. Info on other clothing. *Special Order Mfg. Co.*

73—Book Case Shelving. Bulletin No. B-70 (4 pages) illustrates and describes four styles and 10 sizes of phosphatized shelving. Includes data on single-and double-faced units. *Alan Wood Steel Co.*

NOW! from Bausch & Lomb, an ALL-NEW Cup-Type GOGGLE LINE

NEW! A complete, improved line of chippers' and welders' goggles in regular and coverall types!

NEW size, new safety-comfort contours, new visibility!

NEW super-tough thermo plastic material for new strength, new durability in high-luster cool green finish!

NEW efficiency features, cleanliness features, new interchangeability!

NEW value: all these features at no increase in prices!

BAUSCH & LOMB

SINCE B&L 1853

BAUSCH & LOMB OPTICAL CO.
90135 Smith St., Rochester 2, N. Y.

Please rush illustrated spec folder (A-1684) showing the all-new Cup Goggle Line.

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

.....

For more facts circle 604 on Reader Service Card

For more about these items, circle numbers on Reader Service Card next to back cover.

POWDER ADDED TO WATER FORMS THICK JELLY.

GOLF BALLS STAY SUSPENDED IN NEW CHEMICAL.

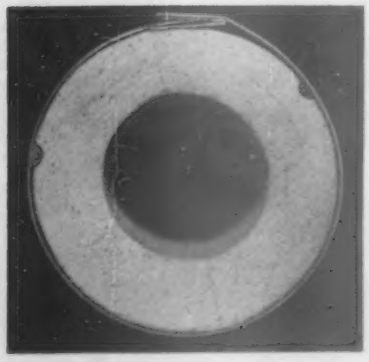
New Polymer Chemical Does Many a Job

A water-soluble polymer in the form of a fluffy white powder has just been developed. It's said to be "the most versatile agent ever discovered for thickening, suspending, dispersing, and emulsifying."

Called Carbopol, it is the first of a family of polymers. It is non-toxic and relatively unaffected by temperature and aging. Some of its applications will be in waterproofing and oilproof coatings, printing inks, pharmaceuticals, rubber cements. Here are some of the advantages imparted to products by the addition of this powder: Improves flow of paints by setting up a resistance to running and dripping; stabilizes emulsions and suspends abrasives in waxes and polishes, and prevents the clogging of nozzles in spray applications.

In the field of metal drawing, Carbopol can suspend heavy metal compounds used in drawing lubricants. Its strong gel structure gives the solution excellent body and staying power—yet it can be pumped, stirred, or spread as readily as a light, airy material. It can also be used to suspend particles that usually settle to the bottom of a bottle. This eliminates the "shake-well-before-using" warning.

B. F. Goodrich Chemical Co. (Circle 251, Reader Service Card.)



Easy-to-Install Pipe Insulation

Calcium silicate insulation and an aluminum jacket all in a single package is provided by a new product called Metal-On Pipe Insulation.

The new product is economical to use since both the insulation and the jacket can be installed in one operation—required installation time, from carton to pipe, is 90 seconds. There is no fitting problem; the insulation is cut right on the job. Complete unit is installed by snapping it onto the pipe. Joints are sealed with metal snap straps that are held in place with mechanical fasteners.

Metal-On has been designed for temperatures up to 1200 F. It is available in 36-in. sections in a complete range of sizes up to 24-in. pipe size by 3 in. thickness.

Johns-Manville Sales Corp. (Circle 252, Reader Service Card.)

Turn the page

"Take a tip from me—

One slip can cost more than USS Multigrip"

Men who work in slippery places . . . push heavy loads . . . or merely walk up and down stairs know what it means to have sure traction underfoot.

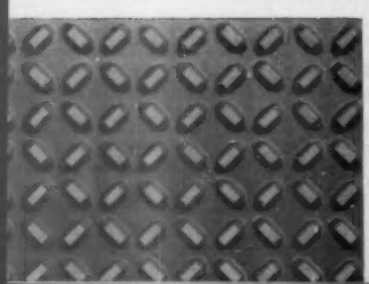
They can't wear shoes with cleats, but you can give them a floor with cleats–USS* Multigrip. Dozens of little studs provide maximum skid resistance in any direction. They are flat on top, easy to walk on—but do not catch the shoe.

Whether a landlubber or a seafarer, Multigrip assures you the same fine service. Wet or dry, Multigrip supplies safety plus.

For locations that take a heavy beating from traffic, Multigrip provides a floor that will stand up under years of constant use. Oil won't soak in and can be easily removed with regular cleaning materials. You save money by having a floor that is easy to sweep or flush clean, lasts for years with no maintenance.

On your next inspection trip, look around for danger spots—and make them safe with Multigrip*. You can get it from our local distributor.

Sold by leading distributors from coast to coast.



United States Steel Corporation – Pittsburgh
Tennessee Coal & Iron – Fairfield, Alabama
Columbia-Geneva Steel – San Francisco
United States Steel Supply – Steel Service Centers
United States Steel Export Company

USS United States Steel

*TRADEMARK

NEW IDEAS? I SURE GET PLENTY AT THE POWER SHOW. NO DOUBT ABOUT IT, BILL, I ALWAYS GET A WEALTH OF ENGINEERING INFORMATION BY TALKING TO THE EXHIBITORS' TECHNICAL PERSONNEL. AND THIS IS THE PLACE TO SEE AND COMPARE NEW, COST-SAVING EQUIPMENT.
YES, ED. WE'RE ESPECIALLY CONCERNED RIGHT NOW WITH LOWERING OUR PRODUCTION COSTS. AND SOME OF THE IDEAS I'VE PICKED UP HERE ARE GOING TO HELP DO IT.

You, too, can secure valuable NEW IDEAS at the

23rd National Exposition of Power & Mechanical Engineering

Auspices of ASME

New York Coliseum **December 1-5, 1958**

Register in advance by writing the exposition at 480 Lexington Avenue, New York 17, N. Y.

Management: International Exposition Company

1240

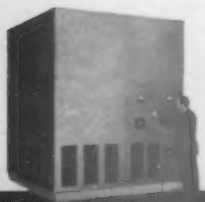
For more facts circle 605 on Reader Service Card

PREFERRED

Sel-Rex®

CUSTOM ENGINEERED RECTIFICATION

- *Germanium*
- *Silicon*
- *Selenium*



Of the thousands of Sel-Rex Rectifiers in use, a large percentage are "repeat orders"—units purchased only after an original installation had thoroughly proven itself.

Our users include the country's foremost electrical and electronic concerns* — companies best qualified to evaluate rectifier equipment.

***names on request**

Send for FREE "GUIDE" to Industrial Rectifier Equipment.

Rectifier Division

SEL-REX CORPORATION

NUTLEY 10, NEW JERSEY

Representatives in Principal Cities

"Complete Semiconductor Power Conversion Systems for any AC to DC application."

FACTORY / MATERIALS NEWS

Begins on page 236

For more about these items, circle item numbers on Reader Service Card next to back cover.

253—Anti-Sticking Agent, called Slide, is an aerosol spray with high silicone content. Clean, colorless, odorless, and non-staining; will not damage or deface finished product. Low surface tension allows it to spread out for thorough lubrication. *Perc E. Harms Co.*

254—Coatings and Sealers include over a dozen products for insulation and plant maintenance applications. Offer low-cost protection for plastics, masonry, metal. And it's a weather-resistant "breather" insulation for heated equipment. *Insul-Coustic Corp.*

255—Low Static Styrenes in two general-purpose formulations are now available. One is a standard molding grade; other has improved heat resistance. Said to practically eliminate electrostatic fields that attract dust. Crystal and special colors. *Monsanto Chemical Co.*

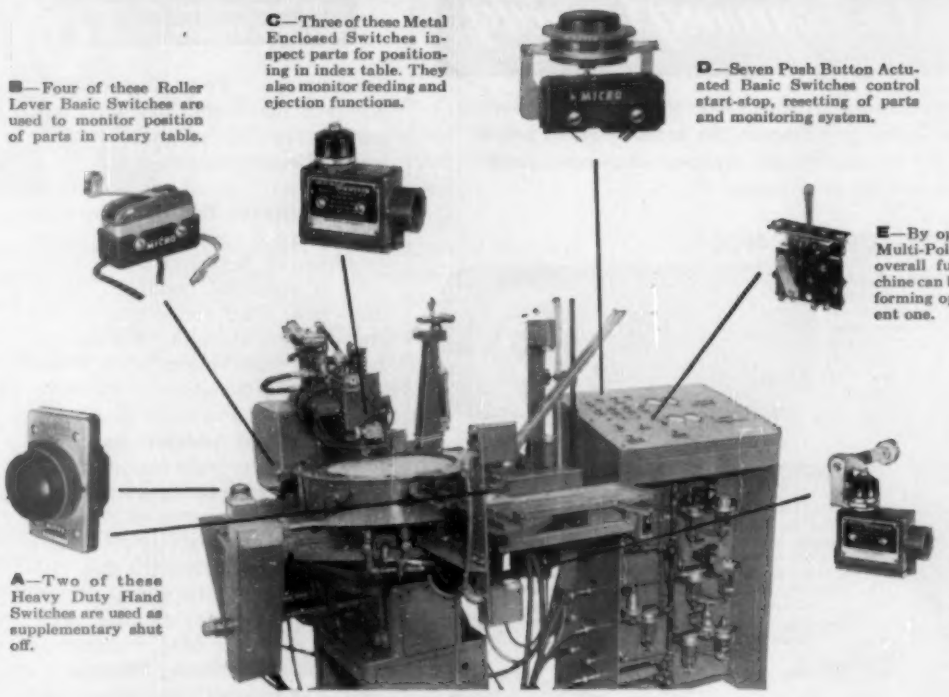
256—Glass Frosting to kill sun's glare allows light to pass without changing anything but its intensity. Comes packaged in aerosol spray can. The fine mist spray valve eliminates runs and speeds drying time. Color is near-white. *Crown Industrial Products Co.*

257—Mineral Absorbent will keep floors dry, clean and safe. Product thoroughly absorbs oils, greases, liquids and their odors, and stays dry. Material is granular; spreads easily, does not pack down. Comes in 50-lb. bags. *Minerals & Chemicals Corp. of America.*

258—Two-Conductor Rip-Cord cable provides easy, low-cost wiring of intricate chassis. Flexibility and miniaturization is said to provide space, weight, cost savings for many applications. Easy-to-strip outer binding of transparent Teflon tape. *Tensolite Insulated Wire Co.*

259—Packaging Film for metal products protects precision parts from rust and dirt. Allows easy inspection and identification without

MICRO SWITCH Precision Switches



B—Four of these Roller Lever Basic Switches are used to monitor position of parts in rotary table.

C—Three of these Metal Enclosed Switches inspect parts for positioning in index table. They also monitor feeding and ejection functions.

D—Seven Push Button Actuated Basic Switches control start-stop, resetting of parts and monitoring system.

E—By operation of this one Multi-Pole Toggle Switch, the overall function of the machine can be changed from one forming operation to a different one.

A—Two of these Heavy Duty Hand Switches are used as supplementary shut off.

F—Eight of these Adjustable Roller Lever Enclosed Switches, in two banks, control forming operation, starting and stopping point of table, feeding, air cleaning and ejection of parts.

One Operator per Week instead of Four

120 Man-hours Saved per Week

3000 Pieces per Hour instead of 1600

These remarkable savings are typical of those that can be affected on many machines by automating them with MICRO SWITCH Precision Switches.

In addition to the savings set forth above, this manufacturer of small, electrical products reports a total elimination of scrap parts and an additional saving of 175 hours per week in other departments.

Management in all types of business has accepted and proved the worth of this simple, inexpensive way to modernize existing equipment with MICRO SWITCH Precision Switches.

And, it *is* simple to do. Your own electrical maintenance men, cooperating with your plant engineering staff or with your local industrial electrical contractor, can do it.

We will venture to say that once you automate one machine in this way, you will soon apply MICRO SWITCH Precision Switches to other production tools in your plant.

Find out about this method of relieving the "profit squeeze" by contacting an authorized MICRO SWITCH distributor. You'll find his name in the Yellow Pages.

MICRO SWITCH . . . FREEPORT, ILLINOIS

A division of Honeywell

In Canada: Honeywell Controls, Ltd., Toronto 17, Ontario

Honeywell

MICRO SWITCH PRECISION SWITCHES

Let These Four GOODALL Products Prove Their Cost-Saving Quality

Because they are made to meet Goodall's high standards for materials, workmanship and service performance, the products shown below will demonstrate for you the quality and economy which have established their reputations in many other plants.

"ALL-SERV" GENERAL-PURPOSE HOSE

The one hose for a wide variety of applications ... air, water, oil, gasoline, paint spray, grease gun, etc. Buy it in long lengths ... cut and couple it as required ... to keep hose inventory down. Molded-and-braided, all "Synplastic"® construction, with tough, wear-resistant cover. Extremely flexible. Sizes ¾" to 1½"; one, two and three braids; maximum lengths of 500 feet. Working pressures to 300 lbs.

"POWER KING" V-BELTS

Very flexible high-capacity V-Belts with *less stretch* ... so little that the efficiency of the drive is not affected. Built with larger grommets, having 40% more tensile strength, their ability to transmit greater HP means fewer belts per drive, reduction in over-all weight, and less space required for any given load. The over-size twin grommets are endless ... no intermediate overlapping or splicing. That's why "Power King" belts are much stronger, stretch less, carry greater loads and last 20 to 50% longer.

PACKINGS for Every Service

High-pressure Asbestos Packing, Style A-400 (illustrated) for steam, gas and oil; Self-sealing Molded Lip Packing for air, gas, oil, chemicals, steam, water, etc.; Square Braid Asbestos Packing Style A-444, for centrifugal and rotating pumps; Red Rubber Sheet Packing, Style M-16, for gaskets under saturated steam, hot or cold water and air; Braided and Twisted Valve Stem packing; Long-Line Flax Packing; Low-Pressure Duck and Rubber Stem Packing. Hot Oil Packing; Plastic Packing, and many others. Send for Packing Catalog.

"ALLGOOD" MAINTENANCE COATINGS

The economical way to give long-lasting protection to plant and equipment from the effects of weather, corrosion and other destructive agents. With no greater time or effort than required to apply ordinary paint, "Allgood" Maintenance Coatings can be brushed- or sprayed-on to give a tough, durable covering that will pay for itself over and over again through savings in maintenance and replacement costs. Equally effective on metal, wood and concrete. Made in several different formulas to meet specific conditions. Available in quart and gallon cans from your nearest Goodall branch.

"If it's GOODALL, it MUST be GOOD!"

Contact Our Nearest Branch

Standard of Quality—Since 1870

HOSE • BELTING • FOOTWEAR • CLOTHING AND OTHER INDUSTRIAL RUBBER PRODUCTS

GOODALL *Rubber Company*

GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.

BRANCHES AND DISTRIBUTORS THROUGHOUT THE UNITED STATES. IN CANADA: GOODALL RUBBER CO. OF CANADA LTD., TORONTO.

FACTORY / MATERIALS NEWS

Begins on page 236

For more about these items, circle item numbers on Reader Service Card next to back cover.

unwrapping. This high-strength polyester film resists moisture, oils, greases. In rolls or pouch form to order. *Daubert Chemical Co.*

260—Conveyor Belt of a non-stick Teflon-coated glass fabric solves problems of heat and sticky materials in industrial handling. Structures have good abrasion resistance and physical strength. For diversified and lightweight applications. *H. K. Porter Co., Inc.*

261—Fuel Oil Additives have been developed to provide maximum efficiency in the burning of fuel oils. This "family" consists of Petrosene B, C, and D that act as dispersants and inhibitors. Petromix No. 9 is an emulsifier and dispersant. *L. Sonneborn Sons, Inc.*

262—Safety Surfacing Material is a paint-like product with non-abrasive particles in liquid form. Can be applied to all types and contours of materials. Dries to a long-wearing and non-sparking surface. Comes in colors. *California Industrial Development Co.*

263—Hydraulic Fluid and lubricant base, an alkyl silane, is said to have better lubricating properties than most high temperature fluids. Thermally stable in closed system over range of -25 to +550 F. for long periods, up to 700 F. for short. *Dow Corning Corp.*

264—Steel Cutting Composition is said to reduce finishing costs on certain steel and stainless steel parts. Liquid's fast cutting ability results in good color and good final plated surface—without further buffing *Frederic B. Stevens, Inc.*

265—Synthetic Chain Lubricant is a tacky, semi-fluid grease that completely resists wipe-off, throw-off, and run-off. Remains effective from six months to over a year. As a film, it's a good rust preventive. Comes in 14-oz. cartridges, 35-lb. pails. *Lehigh Chemical Co.*

Turn the page

"SPANGRID *Steel Pipe...pre-cut to our specifications...*
SAVED US 133 MAN-HOURS!"

Says Robert B. Anderson, President of R. B. Anderson, Inc., mechanical contractor for Karan Corporation Building, Denver, Colorado

"SPANG helped us where it counts . . . in savings of time and money," states Mr. Anderson. "The problems my company faced on the Karan radiant heating job are universal: to meet the job specifications and deadline and yet keep costs down. Thanks to SPANG we did just that. SPANG gave us swift delivery of the entire order—10¼ miles of SPANGRID Steel Pipe, pre-cut to non-standard lengths.

Spang Supplied Special Pipe Lengths

"What impressed me," says Mr. Anderson, "was SPANG's ability to deliver their one-inch in lengths of 38 feet. If we had been able to get only the standard length—21 feet—we would have had to make 800 extra welds. This saved us approximately 133 man-hours, or $465.00.

Fast Service From Spang

"SPANG delivered our entire order of CW Pipe two weeks ahead of earliest date offered by their competitors. This enabled us to fabricate the entire radiant heating system by the time the general contractors were ready to pour the concrete floor slabs."

You Can Get Top-Quality Service, Too!

Your local SPANG Distributor can give you this same fine service on your SPANG CW Pipe order. SPANG Pipe is manufactured under strict quality-control methods, tested and inspected to assure you of a top-quality product every time. Make it steel pipe—make it SPANG.

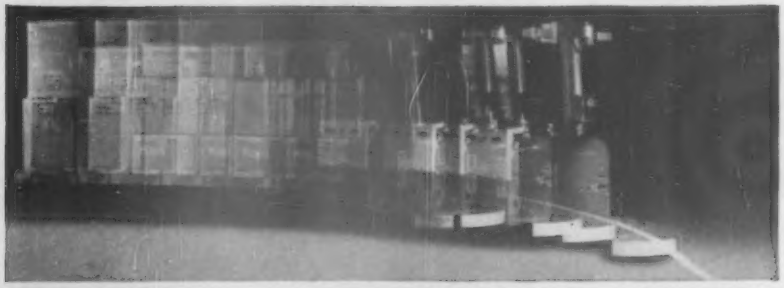
Architect: Stark and Kondel, Denver,
General Contractor: J. & K. Construction Company, Denver
Mechanical Contractor: R. B. Anderson, Inc., Denver
SPANG Distributor: Great Western Pipe and Supply, Denver

Welder is shown assembling the radiant grid coils, which will be imbedded three inches below the surface of a 6 to 8-inch thick concrete slab floor. More than 10¼ miles of SpanGrid Steel Pipe were installed.

SPANG-CHALFANT
DIVISION OF THE NATIONAL SUPPLY COMPANY
General Sales Offices:
Two Gateway Center, Pittsburgh, Pa.

SPANG®
CW STEEL PIPE

Automated materials handling by BARRETT



Guide-O-Matic turns lost motion into new profits . . . everywhere

Versatility as a money-saver—that's another remarkable feature of this operatorless Barrett Guide-O-Matic tractor. No matter what the material movement problem, the job or place, Guide-O-Matic works—most often, works wonders. Needing no driver, it reduces costs. Efficient, it frequently does the job of several pieces of other equipment, reducing equipment investment. Steady and safe, it eliminates human error and abuse... protects the load... lowers operating costs.

Successful Guide-O-Matic users include companies of all types and sizes: Westinghouse, Hallmark, Corning Glass, Procter & Gamble, Super-Valu Stores, Esso, The Hecht Co., Stix, Baer & Fuller, International Paper, and a host of others.

Just your thought of *automated* materials handling justifies your inquiry. Descriptive literature and engineering advice on the Barrett Guide-O-Matic Tractor are yours for the asking.

BARRETT-CRAVENS COMPANY
616 Dundee Road, Northbrook, Illinois

Representatives in All Principal Cities. Canadian Licensee, S. A. Armstrong, Ltd., Toronto, Canada

For more facts circle 610 on Reader Service Card

FACTORY / MATERIALS NEWS

Begins on page 236

For more about these items, circle item numbers on Reader Service Card next to back cover.

266—Insulated Blankets and housings, factory-sheathed in heat-resistant foils, fit unusual shapes, permit low-cost assembly-line installation for service to 2000 F. Applications: gasoline engines, turbines, valves, etc. *Johns-Manville.*

267—Pressure-Treated Wood has been classified by fire underwriters as basically non-combustible and approved for construction applications. Said to be only pressure-impregnated wood product now available that meets rigid specifications. *Koppers Co., Inc.*

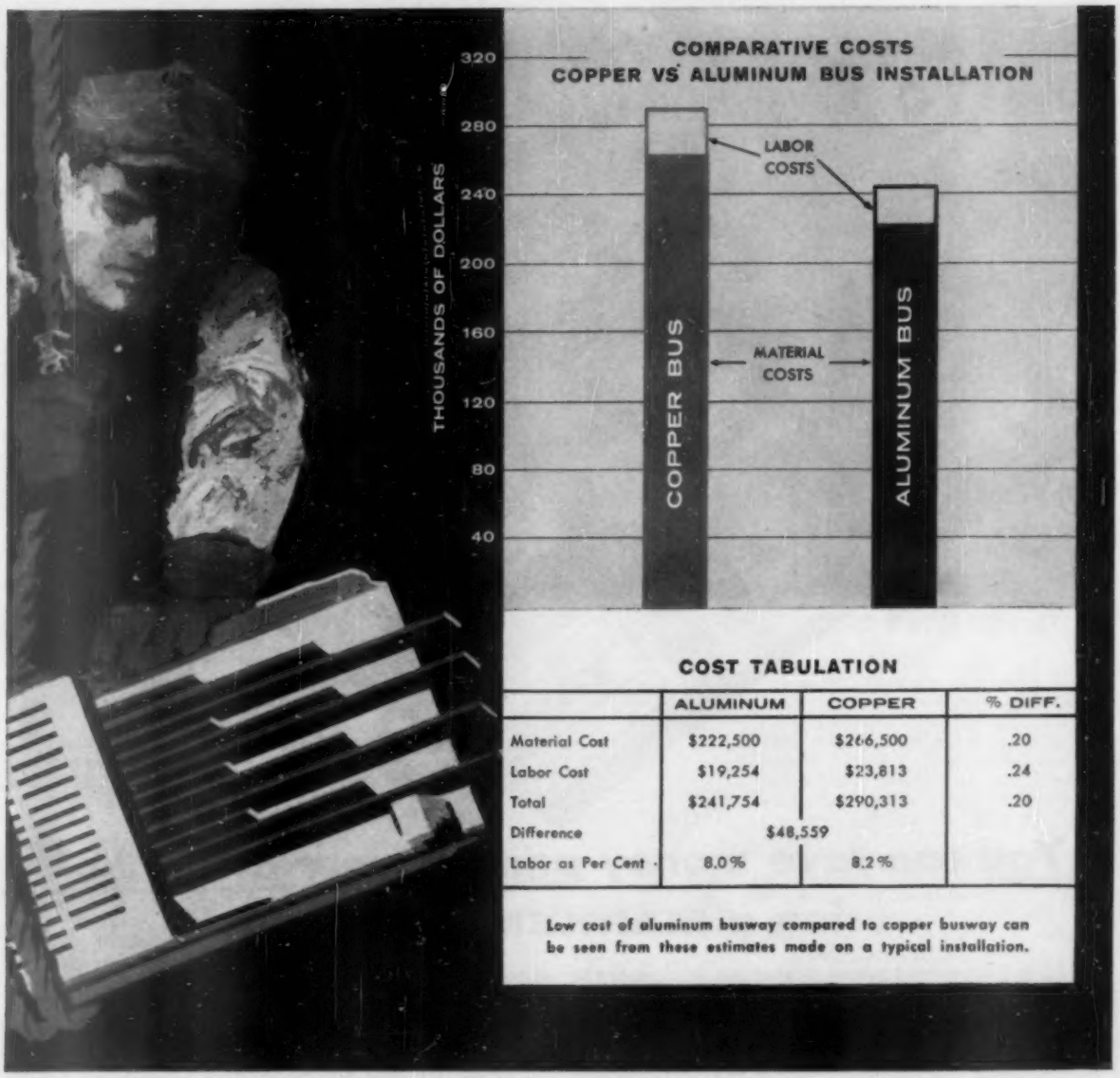
268—Metal Polish, called Met-All, eliminates the dullness characteristic of aluminum after exposure to dirt, oxidation, water stains. Contains no abrasive. For copper, brass, chrome, silver, pewter. In 2-lb. tins. *Anton Co.*

269—Thin-Walled Ceramics formed into lightweight honeycomb structures withstand temperatures up to 1000 C. (1800 F.) with virtually no thermal expansion. Can operate continuously at 700 C. (1290 F.) Applications: air preheaters, aftercoolers, etc. *Corning Glass Works.*

270—Capillary Tubing now comes up to 3000 ft. long, with flow rate tests when required. Longer lengths give greater uniformity, continuous automatic fabrication with minimum downtime for changing reels. *Superior Tube Co.*

271—Heavy-Duty Pipe Fittings incorporate an original method of "beefing up" butt-welded joints with continuous bands of PVC—which provides increased safety. Include standard fittings such as elbows, connectors, etc. *S. & C. Mfg. Co.*

272—Carbon Filter Tubes, in a variety of styles, are available with any desired internal or external machining. Configurations of porous carbon filter tubes include plain open-end, blind-end, blind-end with collar flange, and counterbored tubes. *National Carbon Co.*



COST TABULATION

	ALUMINUM	COPPER	% DIFF.
Material Cost	$222,500	$266,500	.20
Labor Cost	$19,254	$23,813	.24
Total	$241,754	$290,313	.20
Difference	$48,559		
Labor as Per Cent	8.0%	8.2%	

Low cost of aluminum busway compared to copper busway can be seen from these estimates made on a typical installation.

ALUMINUM BUSWAY: TODAY'S BIGGEST BUILDING BARGAIN

Lower cost, flexibility, ease of installation spur trend to aluminum

More and more cost-conscious architects, engineers and building owners are insisting that aluminum busway be written into specifications. They've heard about the enormous savings you can expect with aluminum busway: up to 20 per cent on material cost, up to 20 per cent on installation cost and savings in weight, permitting the use of less costly busway supports. They know that aluminum busway will provide a neat, safe installation with the flexibility to meet new or added power demands.

Busway with lightweight Alcoa® Aluminum Bus Bar provides more power per pound of metal and has the same voltage drop and temperature characteristics as a comparable system. Pound for pound, aluminum busway has greater current-carrying capacity than cable in conduit. It also requires less space.

When you need a modern, flexible distribution system, specify busway made with Alcoa Aluminum . . . and *save*. Aluminum Company of America, 2296-L Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM
ELECTRICAL CONDUCTORS AND ACCESSORIES

Your Guide to the Best in Aluminum Value

"ALCOA THEATRE"
Exciting Adventure
Alternate Monday Evenings

For more facts circle 611 on Reader Service Card

You can save money printing your own labels using a MARKEM MACHINE

If you want to save money on your labels . . . improve their appearance . . . be certain of having the right kinds at the right times . . . end inventory headaches, waste from obsolescence, and other label problems — look at the immediate and specific advantages a Markem machine working in your own plant can offer you.

In *savings*, a Markem machine makes it economical to print short runs with frequent changes in variables — the small volume jobs for which high production "outside" printing is unsuited and prohibitively expensive. Savings also result from smaller *inventories* and subsequent *reduced maintenance;* complete *elimination of waste* from obsolete labels; and often, combining *two separate labels into one,* thereby saving the production and application costs of the second label.

Proof that the Markem Method *does* save money are the thousands of manufacturers using Markem machines, type and specialty inks today — to print labels ranging from saddle and die cut roll types for food packages to fabric and paper styles for clothing and textiles . . . pressure sensitive types for the products of the automotive, electrical, electronic, tool and hardware, pharmaceutical, photographic and other industries. Typical Markem machine operations range from overprinting variables on printed tape and cut labels to the complete printing, pinking or cutting, and automatic stacking of fabric labels. Quickly changed type, type inserts in masterplates, or rotatable typewheels allow imprint changes to be made in seconds. More than 10,000 Markem specialty inks answer virtually any requirement in color, drying speed, adhesion, durability and other special property. And Markem machines provide additional advantages in simple operation quickly learned by average female help . . . long, trouble-free performance without breakdowns . . . flexibility that permits one machine to do several marking jobs.

For labels that look better yet cost you less — to speed identification and help build sales of your product — *find out what Markem equipment can do for you.* For product, part and package identification and decoration where *direct marking* is preferable to labeling, similar advantages are also available from many other Markem machines. Send your complete marking requirements to Markem Machine Company, Keene 18, N.H.

MARKEM

EVERYTHING INDUSTRY NEEDS . . . FOR PROFITABLE MARKING . . . SINCE 1911

ADVERTISERS' LITERATURE

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

BUILDINGS

346—Fire Protection. Here's a 44-page reference manual, "Special Hazard Fire Protection." Grinnell Co.

347—Steel Grating. Bulletin 2527 describes features of electroforged grating and treads. Blaw-Knox Co.

348—Gratings. New catalogs available cover two types of open steel floor gratings. The Globe Co.

349—Corrugated Transite. Brochure discusses materials properties and maintenance-saving features. Johns-Manville.

350—Complete Buildings. Bulletin gives complete facts on new steel "budget buildings." Republic Steel Corp.

351—Rust Preventive. Report (30 pages) on rust penetration properties of dampproof red primer. Rust-Oleum Corp.

352—Roof Deck. Catalog 241 gives info on dual-purpose acoustic steel roof deck. Inland Steel Products Co.

353—Transite Pipe. Pressure pipe folder TR-160 gives complete properties and applications. Johns-Manville.

354—Fence. Booklet "Your Fence" gives info, applications. Cyclone Fence, American Steel & Wire Co.

MATERIALS HANDLING

355—Lift Truck. Bulletin gives complete facts on new type of lift truck. Automatic Transportation Co.

356—Mobile Electrification. Catalog describes mobile-electrification system for cranes. Insul-8-Corp.

357—Lift Truck. Bulletin BU-485: new 2000-lb. model. Allis-Chalmers, Engine-Material Handling Div.

358—Tramrails. Booklet No. 2008 is packed with valuable information. Cleveland Crane & Engineering Co.

359—Lift Truck. Brochure gives full details, describes features of new electric truck. Clark Equipment Co.

360—Storage Racks. This catalog covers full line for any industrial use. Equipment Manufacturing, Inc.

361—Crane Control. Bulletin 6431 has details on full magnetic VL a-c control. Electric Controller & Mfg. Div.

362—Air Hoist. Bulletin 86 gives complete data. Capacities: 150, 300, 500, 2000 and 4000 lb. Gardner-Denver Co.

363—Trolley Conveyor. Book 2330 describes mechanical features with varied applications. Link-Belt Co.

364—Roller Conveyors. Catalog 156 gives the latest data on maker's complete line. Mathews Conveyer Co.

365—Bulk Conveyors. Bulletin 530 (32 pages) presents detailed conveyor information. Dracco Div., Fuller Co.

366—Slings. Handbook gives complete data on types, dimensions, weights and rate loads. Union Wire Rope Corp.

367—Gondola Car Covers. Tells how to provide damage-free shipping of rolled steel in coils. Republic Steel Corp.

368—Pneumatic Conveyors. Bulletin 143-B gives complete information, cost-saving hints. The Spencer Turbine Co.

369—Metal Lumber. Information on portable tiering drum racks each holding two 55-gal. drums. Republic Steel Corp.

ELECTRICAL

370—Electrical Modernization. New brochure, "59 Ideas For Modernization in '59." Allis-Chalmers Mfg. Co.

371—Fuses. Two bulletins: FIS on Fusetron Fuses; HCS on high-capacity fuses. Bussman Mfg. Div.

372—Silicones. New booklet details advantages of silicone insulated equipment. Dow Corning Corp.

PRODUCTION

373—Industrial TV. Illustrated brochure covers industrial TV equipment and systems. Philco Corp.

374—Cleaning Solvent. Book describes Clorothene for production and maintenance cleaning. Dow Chemical Co.

375—Schedule Board. Bulletin X-500 shows varied applications of visual control board. Graphic Systems.

376—Lubricants. Illustrated bulletin describes multipurpose lubricant and hydraulic fluid. Gulf Oil Corp.

377—Tool Control System. Booklet: "How Tool Costs Were Cut 12 Ways in 20 Plants." McCaskey Div., Victor Co.

Turn the page

pole-type INDUSTRIAL buildings

Are Permanent

Pole buildings are "wrapped around" poles firmly anchored in the ground. This forms a sturdy super-structure that will withstand heavy winds and rough weather. The poles, and all lumber near the ground, are pressure-treated to resist decay and termite attack. Maintenance over the years is negligible.

Add to this long life and minimum maintenance the fact that pole-type buildings go up fast and cost much less than conventional structures, and you'll see why it may be wise to investigate pole-type construction before you build.

The storage building and machine shop shown above was erected in seven weeks at a cost of only $2.95 a square foot. You too can save with pole-type construction.

For full particulars fill out and mail the coupon today. No obligation.

KOPPERS

POLE-TYPE BUILDINGS

C-16

Wood Preserving Division
Koppers Company, Inc.
785 Koppers Building
Pittsburgh 19, Pennsylvania

Please have a Koppers Qualified Contractor contact us.

NAME_____

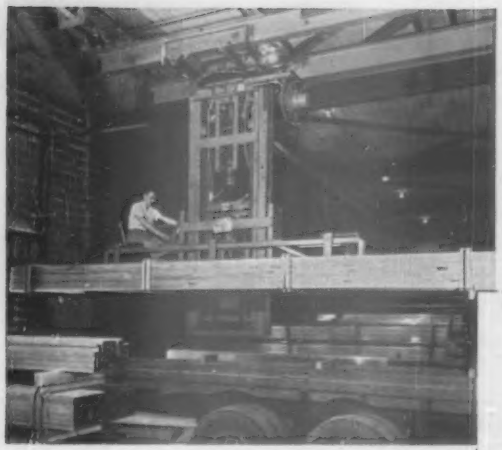
TITLE_____

COMPANY_____

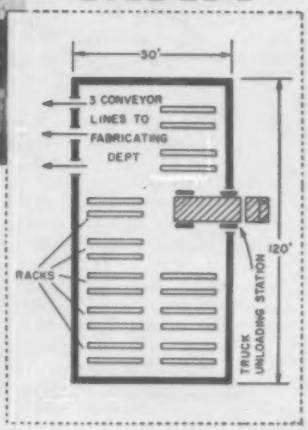
ADDRESS_____

CITY_____ ZONE____ STATE____

Circle 613 on Reader Service Card



1 MAN ...and TRAK-RAK



handle complete warehousing operation

UNLOADS TRUCKS, STORES MATERIAL IN 1 OPERATION

When the Per-Fit Products Corp., Indianapolis manufacturer of aluminum windows installed a Chicago Tramrail TRAK-RAK unit in its warehouse, it gained 4 big advantages:

1. **Increased the capacity of existing storage area.**
2. **Reduced handling costs by permitting 1 man to handle the entire warehouse.**
3. **Kept production lines supplied with on-time material deliveries.**
4. **Handled high grade aluminum extrusions without damage.**

The TRAK-RAK unit installed at Per-Fit consists of a 1 Ton capacity underrunning crane from which is suspended an electrically operated rotating telescoping column which is fitted with a three-fork carriage. All operations of the TRAK-RAK unit are controlled by the operator, who rides with the carriage. The unit serves a series of self-standing racks equipped with arms which receive the bundled material. Because the TRAK-RAK column requires minimum operating space, the aisles between racks are very narrow.

Trucks delivering material are unloaded (top picture) by the unit, which moves over the tops of the racks (below) to the proper rack and deposits its load in 1 operation. When a particular bundle is required by production, the operator moves to the rack, picks up the bundle, and, moving overhead, travels to the conveyor lines (drawing) and sets the bundle down on the designated conveyor line.

TRAK-RAK Systems of vertical storage and handling are saving time and money in warehouses and production plants of all types. *For complete details on how TRAK-RAK can help solve your problems, write:*

CHICAGO TRAMRAIL CORPORATION

1334 S. Kostner Avenue • Chicago 23, Illinois

ADVERTISERS' LITERATURE

Begins on page 245

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

378—Speed Variator. Bulletin GEA-6643 tells of new, packaged, adjustable-speed drive. General Electric Co.

379—Cutting Machines. Catalog 2011 gives construction, engineering details. Cleveland Crane & Engineering Co.

380—Couplings. New bulletin 4100 gives mechanical features of controlled torque couplings. The Falk Corp.

381—Finishing Systems. Catalog A-659 describes both spray booth and finish baking oven. The R. C. Mahon Co.

382—Spray Booths. Catalog I-7000 tells how standardized spray booths save assembly costs. The DeVilbiss Co.

383—Screwdrivers. Bulletin 580 on "Magnamatic" units for multiple uses. Chicago Pneumatic Tool Co.

384—Screwdrivers. Booklet SP-3165 tells case histories of "Magnamatic" uses. Chicago Pneumatic Tool Co.

385—Pneumatic Devices. This portfolio contains schematic layouts, wiring diagrams, etc. The Bellows Co.

386—Speed Reducers. Book 2651 fully describes maker's line of in-line helical gear drives. Link-Belt Co.

387—Fastening Tools. Catalogs 30-A and 30-B on screwdriving and nut running tools. Apex Machine & Tool Co.

388—Riveters, Clinchers. Bulletins 646 and 555 give detailed information. The Tomkins-Johnson Co.

389—Speed Reduction Drives. Catalog SRD-58 gives full information and facts. The American Pulley Co.

390—Speed Reducers. Catalog 55 lists complete line, plus detailed mechanical features. Horsburgh & Scott Co.

391—Wire Cloth, Screen. Catalog (94 pages) describes fabrication facilities, etc. Cambridge Wire Cloth Co.

PLANT SERVICES

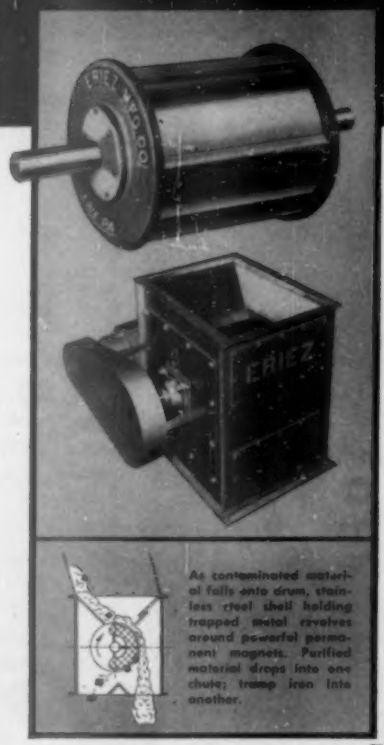
392—Slotted Angle. Brochure on building fixtures and equipment with speed and economy. Acme Steel Co.

393—Three-Way Mixing Valves. Bulletins V-214 and V-215 describe all the features. Johnson Service Co.

Turn the page

Get increased protection...new ERIEZ MAGNETIC DRUMS

now up to 50% stronger than old-style drums!



As contaminated material falls onto drum, stainless steel shell holding trapped metal revolves around powerful permanent magnets. Purified material drops into one chute; tramp iron into another.

Costly maintenance problems eliminated with new replaceable Shell and Bearings! Expanded, improved line of permanent magnetic drums invaluable for automatic continuous removal of ferrous contamination from foods, chemicals, grains, plastics, ceramics, rubber, etc.

Stronger, larger, more efficient magnetic elements provide more magnetic power, better protection than ever before possible! New magnetic units trap and remove small and medium iron fines as well as heavier pieces of tramp metal from processing lines. Protect machinery, prevent fires and explosions, eliminate product contamination. Quickly, easily installed at discharge end of gravity flow chutes, spouts, screw conveyors, etc. For wet or dry materials. With or without housings. Peak protection at low cost.

NEW, TIME AND MONEY SAVING FEATURES! *Easy drum removal;* no need to remove housing. *Bearing replacement simplified;* no disassembly of shell required. *Replaceable shell;* excellent for abrasive applications. Stainless steel shell construction won't pit or corrode. *Dust-tight housing;* all steel, welded construction. *Adjustable magnetic element;* magnetic area can be moved to insure peak efficiency for varying sizes of ferrous contamination. *Lifetime guaranteed permanent magnets;* can't fail or burn out. *Continuous efficiency;* unaffected by external conditions. *Wide range of sizes;* standard diameters of 12", 15", & 18". 24" heavy duty diameter. 10 standard widths.

Eriez, pioneer and world's leading producer of magnetic equipment, builds a complete line of separation, vibration and automation units. Our skilled field and lab staffs are always ready to help solve a problem.

For literature or information, write Eriez Mfg. Co., 701 Magnet Drive, Erie, Pa.

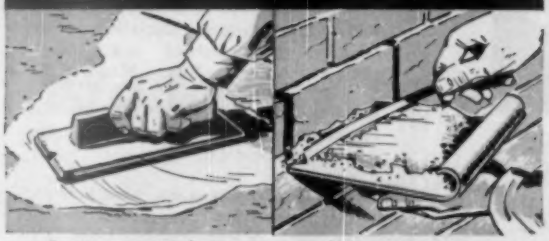
Magnetic SEPARATION AUTOMATION VIBRATION Equipment

ERIEZ HI-POWR MAGNETIC SEPARATORS

ERIEZ

For more facts circle 615 on Reader Service Card

Save Time... Have Lasting Concrete Repairs



Patching concrete floors. Tuck pointing masonry.

Ready-to-Use, **NON-SHRINK EMBECO PRE-MIXED MORTAR**

... Eliminates assembling, proportioning of materials. All ingredients accurately proportioned, thoroughly blended.

... Provides durable repairs because it (1) does not shrink upon hardening, (2) bonds tightly to old concrete and mortar, (3) has higher early and ultimate strength, (4) is dense, resists water and oil penetration.

FREE how-and-where-to-use folder. Write for it.

DIVISION OF AMERICAN-MARIETTA COMPANY

the MASTER BUILDERS co.

CLEVELAND 3, OHIO TORONTO 9, ONTARIO

For more facts circle 616 on Reader Service Card

GUARANTEED

to give drip-tight leak-proof seal

greatest name in unions

DART

Available Through Your Local Dealer

For over 55 years the firm guarantee back of each and every DART UNION sold has been — *"if one should leak through we will give you two"!* The record reveals that less than 1 in every 100,000 has proven to be faulty. The extra wide bronze to bronze seats, precision ground to a true ball joint, mounted in heavy malleable iron pipe ends and protected by an extra heavy union nut, make a drip-tight, leak-proof connection WITHOUT EXCESSIVE WRENCHING time and time again.

Guarantee positive tight connections and extra long service on your pipe lines by using the DART GUARANTEED UNION.

Yours on request: Descriptive brochure on Dart Unions and Union Fittings.

DART UNIONS *Products of* DART UNION COMPANY PROVIDENCE 5, R. I.

GENERAL SALES AGENT

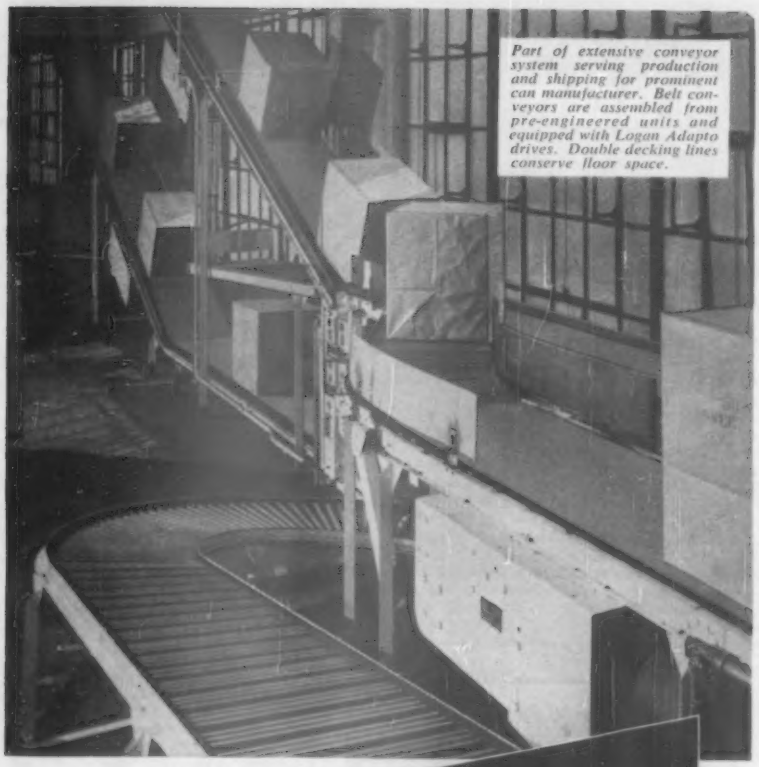
THE Fairbanks COMPANY

393 LAFAYETTE STREET, NEW YORK 3, NEW YORK

BRANCHES: NEW YORK 3

PITTSBURGH 22 • BOSTON 10 • ROME, GEORGIA

For more facts circle 617 on Reader Service Card



Part of extensive conveyor system serving production and shipping for prominent can manufacturer. Belt conveyors are assembled from pre-engineered units and equipped with Logan Adapto drives. Double decking lines conserve floor space.

Trimming costs to meet competition? The solution is mostly in your shop. With so much importance on the production end, it's small wonder that management is giving more and more attention to materials handling.

Logan Conveyors have been the key to greater savings in time, space and effort for large companies and small for over a half century. Production experts who specify Logan, expect and receive equipment designed for sound day-after-day performance.

Why not see what Logan can do for you? Write for more information or for a call from a qualified engineer.

Write for your copy of the Logan TROLLEY CONVEYOR catalog

LOGAN CO., 510 CABEL ST., LOUISVILLE 6, KY.

Logan Conveyors

ADVERTISERS' LITERATURE

Begins on page 245

Offered in ads received up to 5th of last month. To get items you want, circle numbers on Reader Service Card next to back cover.

394—Safety Goggles. Specification folder (A-1684) shows all-new cup goggle line. Bausch & Lomb Optical Co.

395—Fans. Bulletins describe rubber-lined, cast iron, fiber glass fume, materials moving types. Buffalo Forge Co.

396—Unions and Fittings. Descriptive brochure on unions and union fittings upon request. The Fairbanks Co.

397—Unit Heaters. Complete catalog on "clover leaf" type heater discusses features. The Carrier Corp.

398—Dust Filters. New bulletin (105) and 36-page dust control catalog (104). The W. W. Sly Manufacturing Co.

399—Paper Towel Dispensers. Free bulletins on controlled roll paper towel dispensers. Steiner Co.

400—Air Filters. Bulletin 850 contains details on new "conomanual" air filter. Continental Air Filter, Inc.

401—Slotted Angle. This catalog fully describes new slotted construction angle. Republic Steel Corp.

MAINTENANCE

402—Work Platform. Circular tells about telescoping aluminum work platform. Up-Right Scaffolds, Inc.

403—Floor Machine. Literature on combination floor-scrubber and vacuum cleaner. Advance Floor Machine Co.

404—Welding. Bulletin SB-1339 describes portable power generator and welder. Lincoln Electric Co.

405—Floor Maintenance. Free how-and-where-to-use folder for repairs on concrete floors. Master Builders Co.

Free File Copies . . .

. . . of selected FACTORY articles, specially suited for your reference files, are available via Reader Service Card, next to back cover. For complete description of titles, see page 214. Pick your titles, then circle appropriate numbers on Reader Service Card, tear out card, drop it in nearest mailbox. Offer is good (in U.S. and Canada) as long as our supply lasts. We'll be announcing new File Copy titles next month.

Walkway to efficient dust control

Pangborn Cloth Bag Dust Collector on the job. This is just one of Pangborn's complete line of wet and dry dust collectors.

See those bags? They're the *collect* in the Pangborn Cloth Bag Dust Collector. And they're efficient! The cloth filter has proved the most practical method for collecting finely divided dry dusts. But Pangborn goes a step further. Pangborn engineering has not only adapted this design to increase its collecting effectiveness but has simplified its construction. This means you save money. The Pangborn Cloth Bag Collector offers maximum efficiency, yet is economical to buy, install and operate.

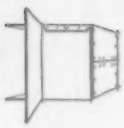
Pangborn engineering is important to every dust-producing plant, regardless of the kind of collector needed. It is not enough to put a dust collector within a plant. An efficient dust collecting system must be *scientifically* planned, designed and constructed to handle effectively a specific dust problem. This thinking is incorporated into every Pangborn proposal.

The Pangborn Engineer in your area will be glad to go to work for you. He is a dust expert *and will discuss your individual problem at no obligation. And, for more information, write for Bulletin 922 to:* Pangborn Corp., *2100 Pangborn Blvd., Hagerstown, Md. Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

For more facts circle 619 on Reader Service Card ➤

CLOSURE IDEA BULLETIN

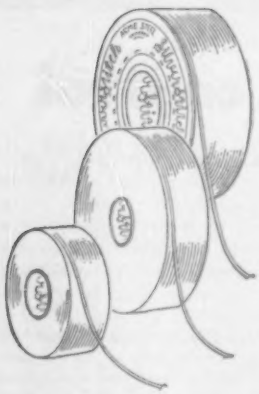


For users of Fibreboard Boxes

Present closure methods unsatisfactory? Check advantages of wire stitching... mechanically uniform, secure closures, even with unskilled operators...stitches not affected by heat, cold, moisture...secure closure maintained even when box is wet.

Arcuate stitching method means even greater savings...gives stitches greater column strength which means greater driving strength ...allows equally strong stitches from lighter gauge of wire...switching from .020 to .017 gauge saves 12½% on wire costs. Arcuate Folder answers questions about this method.

Wire check points...if it has electro-galvanized, rust resistant finish...close size tolerance and smoothness to protect vital machine parts...is level wound to help eliminate tangles and snags...it's excellent wire. Acme Steel Silverstitch Stitching Wire checks out on all these points.



Stitcher parts orders promptly filled from nationwide network of Acme Steel warehouses and service offices...only genuine Acme Steel replacement parts reflect same high quality and craftsmanship as original parts... can be depended upon to give same long, satisfactory service. AD-154 gives tips on maintenance and repair.

Your Acme Idea Man is available as a consultant on closure problems. His intensive training, backed by Acme Steel Company's 75 years' experience with closure problems, can be of real time and material-saving value to you. Call him now at the nearest Acme Steel Office, or write to Dept. FAW-118, Acme Steel Products Division, Acme Steel Company, Chicago 27, Ill., for information on the complete line of Acme Steel box, book and metal stitchers.

ACME STEEL WIRE STITCHING

HOW DO YOUR CLEANING COSTS STACK UP AGAINST JENNY'S ?

40-Ton Toggle Press	3 Hours
Automatic Screw Machine	5 Hours
Steel Mill Windows, per 30 panes	15 Minutes
Garage Floors, per 30 sq. ft.	10 Minutes
Machine Shop Floors, per 15 sq. ft.	15 Minutes
8-Ton Woodworking Machine	2 Hours
Overhead Crane Rail Girders, per 6 ft. section	15 Minutes
Pipe Threading Machine	30 Minutes
Small Drill Press	20 Minutes
Railroad Tank Car	2 Hours

meet Jenny . . . the girl with the magic touch

Jenny® SERIES 1800 STEAM CLEANER

Maintenance superintendents report that Hypressure Jenny cuts cleaning time to one-tenth the time required by ordinary methods. Reduces down-time to a minimum. Regardless of how large or how small your cleaning job, there is a Hypressure Jenny to fit your requirements. In addition, the revolutionary Jenolizing process prevents rust after steam cleaning. Write for details now.

SERIES 1800 . . . one of 80 different models and types.

Please send me information on "How Industry Gets More Productive Hours" with Hypressure Jenny Steam Cleaners. 86

Name_____

Street_____

City_____ Zone____ State_____

HOMESTEAD VALVE MANUFACTURING COMPANY
Hypressure Jenny Division • Coraopolis, Pennsylvania

IT PAYS TO STANDARDIZE ON **STANSCREW**

Stanscrew service prevents problem for manufacturer of journal bearings

The wise manufacturer eliminates any possibility of fastener breakage *before* it can become a serious and expensive field problem.

As a prime example, a leading manufacturer of sealed cartridge journal bearings was concerned about the cap screws used to hold one essential part—the thrust cap—in place. They knew the lateral movements of a railroad car resulted in thrust on this cap, imposing extremely heavy loads on these fasteners.

A call to their industrial distributor soon had a Stanscrew fastener specialist on the job. He recommended continued use of a torque wrench and worked out the proper setting so that each fastener carried its rated load. Subsequent laboratory tests proved these recommended torque settings insured against fastener breakage.

The manufacturer accepted these recommendations . . . and thus eliminated a potentially serious problem before it could develop. The torque settings and technique developed by the Stanscrew representative have been incorporated in the company's instruction and maintenance manual to insure proper maintenance procedures.

Technical assistance like this is just one of the many reasons more and more manufacturers are standardizing on Stanscrew. Trained specialists, backed by an outstanding engineering staff, can solve your particular fastener problem. In addition to assuring the dependability of your product, often they can save you money . . . for example by substituting a standard fastener for a costly "special".

Call your Stanscrew distributor today for the answers to your fastener problems. He will see that the Stanscrew Fastener Specialist visits you without delay.

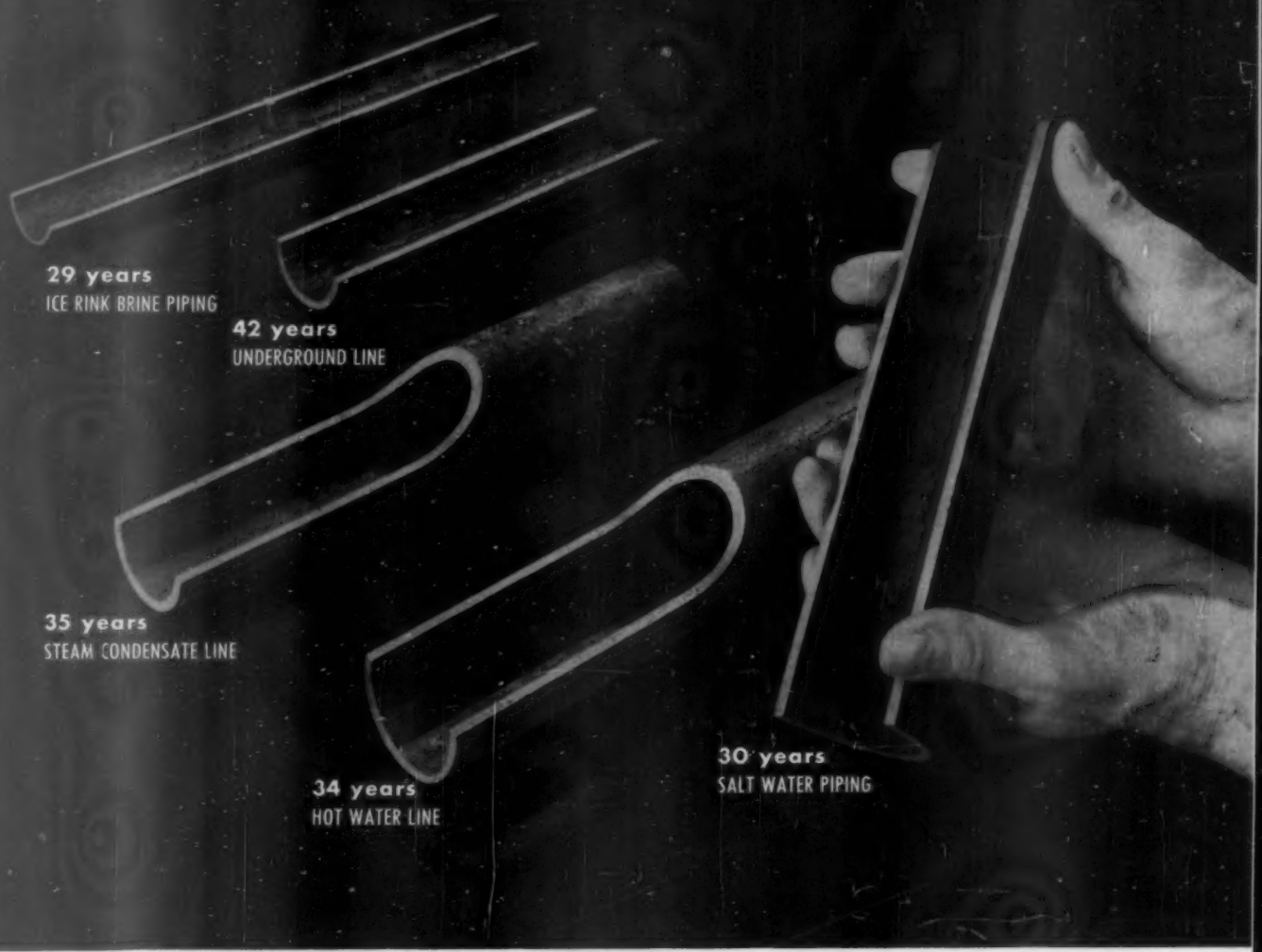
STANSCREW FASTENERS

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS
HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT
WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

STANDARD SCREW COMPANY 2701 Washington Boulevard, Bellwood, Illinois

For more facts circle 622 on Reader Service Card

Here's proof of standard wrought iron's piping longevity . . .



Over 250,000 fibers of glasslike iron silicate guard each cross-sectional square inch of wrought iron pipe against corrosion

Now—4-D Wrought Iron Pipe assures even longer service life

There's a practical, fool-proof way to evaluate a piping material's potential in corrosive plant service: check its performance under actual field conditions.

The photo above shows how standard wrought iron pipe measures up when this service-life yardstick is applied. Here you see actual samples taken from wrought iron pipe installations in a variety of corrosive services. Some of these sections came from buildings and plants that were being torn down. Some were cut from in-use installations by our laboratory staff. They tell a convincing story of piping longevity.

Now, new 4-D Wrought Iron is available to further augment the qualities of *standard* wrought iron, known for decades as the optimum in corrosion resistance. And increased corrosion resistance, improved mechanical and physical properties and greater uniformity widen the gap between 4-D Wrought Iron and ferrous substitutes. In-service and comparative laboratory tests support this conclusively.

Ask the Byers representative to relate the advantages of new 4-D Wrought Iron to the corrosive applications in your plant. And write us for new 4-D Wrought Iron literature and test data. A. M. Byers Company, Clark Building, Pittsburgh 22, Pennsylvania.

BYERS 4-D WROUGHT IRON

TUBULAR AND FLAT ROLLED PRODUCTS

ALSO AMBALLOY ELECTRIC FURNACE STEELS AND PVC PIPE AND SHEET

For more facts circle 623 on Reader Service Card

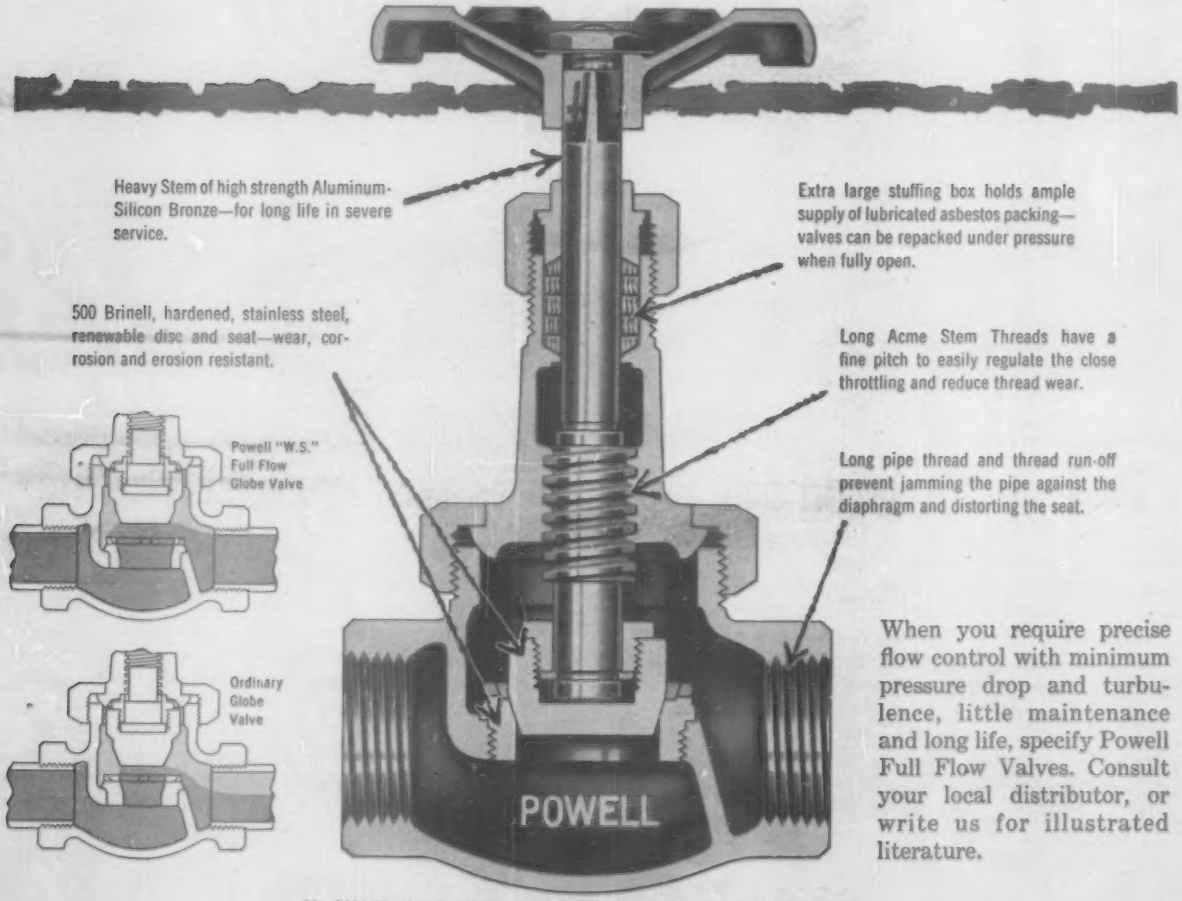
BULLETIN!

POWELL introduces new member in world's largest family of valves

Powell engineered "Full Flow" bronze valves are now available in a full line: the brand-new 150-pound screwed end Globe Valve, in addition to the well-known 200-300 pound Screwed and the 150-300 pound Flanged Globe and Angle Valves.

Although designed by Powell to assure maximum flow with minimum pressure drop and internal turbulence, these valves can be throttled to permit only the minutest amount of fluid to pass through. And, if desired, they can be supplied with Indicator Collar, Arm and V-port Disc for quickly determining flow and holding it constant.

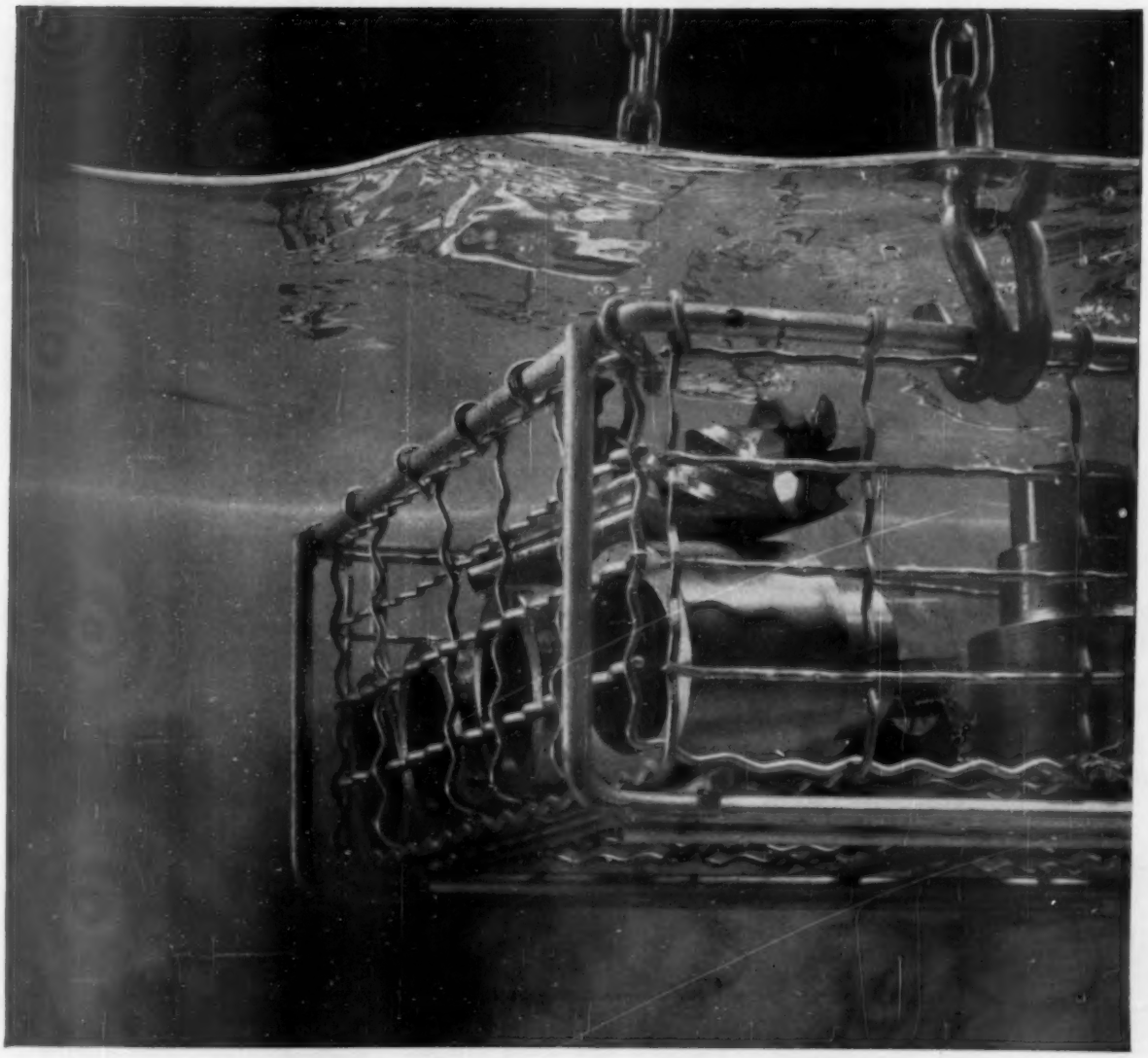
Compare these advantages of Powell Full Flow valves:


Heavy Stem of high strength Aluminum-Silicon Bronze—for long life in severe service.
Extra large stuffing box holds ample supply of lubricated asbestos packing—valves can be repacked under pressure when fully open.
500 Brinell, hardened, stainless steel, renewable disc and seat—wear, corrosion and erosion resistant.
Long Acme Stem Threads have a fine pitch to easily regulate the close throttling and reduce thread wear.
Long pipe thread and thread run-off prevent jamming the pipe against the diaphragm and distorting the seat.
Powell "W.S." Full Flow Globe Valve
Ordinary Globe Valve
POWELL

When you require precise flow control with minimum pressure drop and turbulence, little maintenance and long life, specify Powell Full Flow Valves. Consult your local distributor, or write us for illustrated literature.

Fig. 2600 (Sectional)—150-pound "W.S." Full Flow Globe Valve, Screwed Ends

THE WM. POWELL COMPANY • *Dependable Valves Since 1846* • **Cincinnati 22, Ohio**



For sure, safer cleaning—try Chlorothene

Superior solvent for production and maintenance cold cleaning

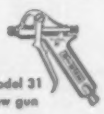
For any type of industrial job—dip, spray, wipe or bucket cleaning—your best bet is Chlorothene® (Dow 1,1,1-trichloroethane, inhibited). This unique Dow solvent removes grease, oil, lubricants and other contaminants quick as a wink, leaving metal parts and equipment with no oily residue.

Chlorothene does a topnotch job on many nonmetallic materials, too—makes cleaning easier, faster and more thorough. And with Chlorothene, you're operating on a new level of safety. Chlorothene, with flammability characteristics similar to trichloroethylene, has no flash or fire point. Its M.A.C. rating is 500 ppm.

If you aren't using Chlorothene already, there's no better time than right now to start. Try it on any production or maintenance cold cleaning operation in your plant. Contact your Dow solvents distributor—same source of supply for Dow Perchloroethylene Industrial, Dow Methylene Chloride, and Dow Trichloroethylene in two new types.

Write today for the Chlorothene book. THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. SO 1151A-1

YOU CAN DEPEND ON DOW

PRODUCTION FINISHING	Model 18	Model 7
GENERAL FINISHING	Model 19	Model 29
TOUCH-UP	Model 26	Model 15
AUTOMATIC APPLICATION	Model 21	Model 18R
HEAVY FLUIDS & COATINGS	Model 7E2	Model 18D
SPECIAL PURPOSE	Model 171 flocking	Model 190 dusting—drying
	 Model 31 flow gun	

One of these Binks spray guns will apply your finishes or coatings ...FASTER...BETTER

Fine finishes...plastics...heavy-bodied coatings—production line tempo or occasional touch-up...there's a Binks spray gun and nozzle combination that is just right for your job...will give you better coverage with fewer passes.

Binks complete spray gun line is the result of having wrestled with the spray application of every imaginable fluid since Joseph Binks invented the first practical spray gun over 50 years ago. It is the result of a shirt sleeve knowledge of your finishing and coating problems and how to solve them.

Free analysis and engineering help

Whether you plan to establish a new finishing department or want more production of higher quality from your existing operation...call Binks' nearest Branch Office or write direct to the address below. Valuable free analysis and engineering assistance is yours for the asking.

P.S. Binks can supply everything your finishing department may require . . . from spray guns to complete, engineered installations.

Ask about our spray painting school
Open to all...NO TUITION...covers all phases

ACCESSORIES

AIR COMPRESSORS

SPRAY BOOTHS

Binks Manufacturing Company
3114-34 West Carroll Ave., Chicago 12, Ill.

Binks
EVERYTHING FOR SPRAY PAINTING

REPRESENTATIVES IN PRINCIPAL U.S. & CANADIAN CITIES • SEE YOUR CLASSIFIED DIRECTORY

For more facts circle 626 on Reader Service Card

BEST FOR MARKING LUMBER!

AMERICAN
400 Series
LUMBER CRAYONS

Designed for greater legibility and longer wear on all types of lumber by Crayon experts . . . You'll find AMERICAN lumber crayons the answer to your marking and checking needs. Available in several different grades and sizes.

Ask for *AMERICAN MARKERS BY NAME* at your favorite supplier.

THE AMERICAN CRAYON COMPANY
SANDUSKY OHIO · NEW YORK

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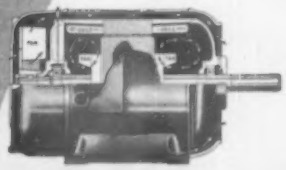
FOR PROVEN ECONOMICAL POWER

AIR COOLED

Custom Built . . .
NOT Custom Priced



VALLEY
BALL BEARING MOTOR

Here's real power, custom built to fit your every requirement. Totally enclosed — fan cooled — polyphase 50 or 60 cycles — constant speed — squirrel cage induction — high torque — low starting current — enclosed ball bearing.

Send for complete details Today.

VALLEY
ELECTRIC CORPORATION
4221 FOREST PARK BLVD. · ST. LOUIS 8, MO.

Circle 628 on Reader Service Card

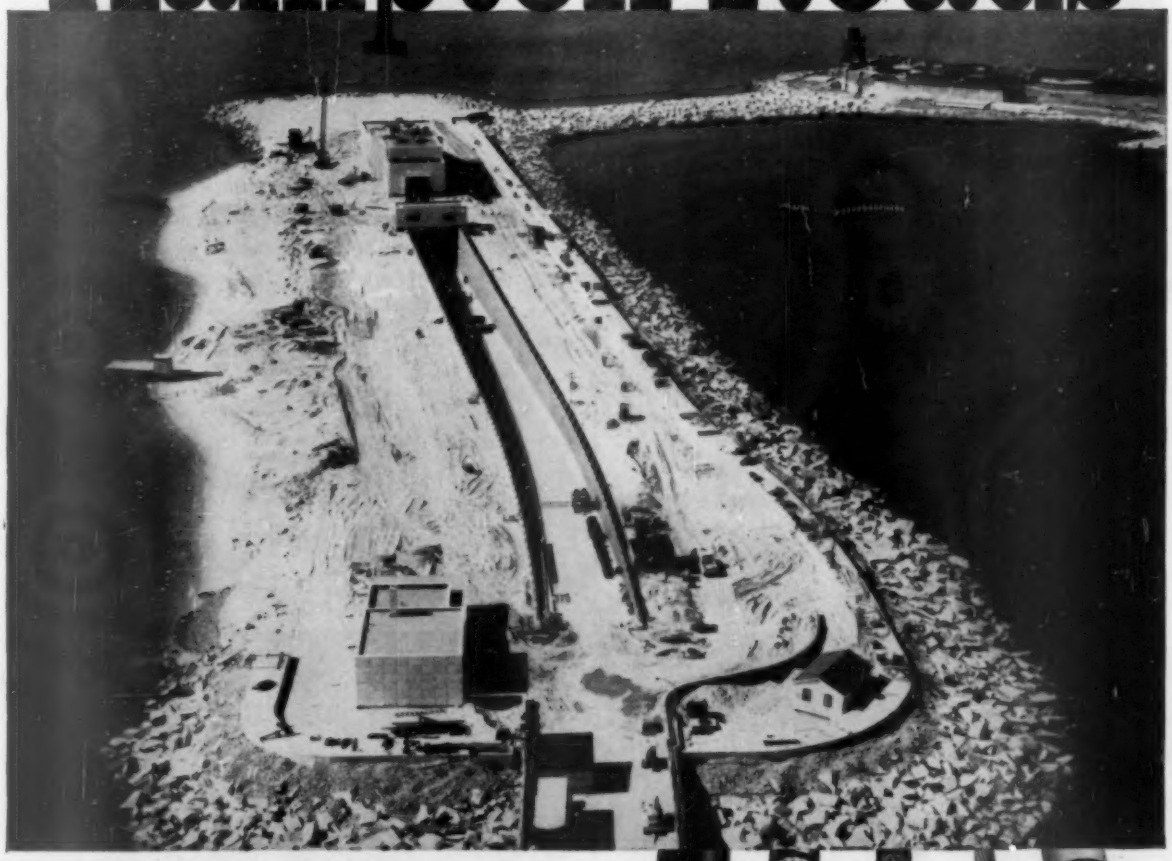
Both tunnel entrances are built on man-made islands connected by bridges to shore. Unusual construction method saved cost, sped completion.

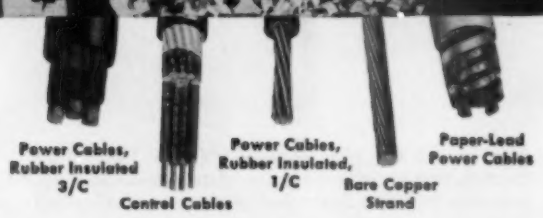
General Contractors: Tidewater Construction Corp.
Merritt-Chapman & Scott

Electrical Contractor: E. C. Ernst, Inc.

Architects and Engineers: Parsons, Brinkerhoff, Hall & Macdonald

Hampton Roads





ROEBLING ELECTRICAL CABLE!
CHOICE FOR THE WORLD'S MOST MODERN EXPRESSWAY PROJECT!

The Hampton Roads Project is a four-mile expressway that carries traffic under and over one of America's busiest maritime channels. It includes a 7,480-foot tunnel.

This important Commonwealth of Virginia Department of Highways project, which cuts over twenty miles from the trip between Norfolk and Newport News, Va., incorporates the most modern concepts and materials in its design. For instance, the tunnel ceiling is porcelainized aluminum. And the wiring for the tunnel, ventilating buildings, the bridges and approaches—that's Roebling Cable!

Five types of Roebling Cable—15kv paper and lead, 600v and 15,000v RR cable, Roeprene® Control Cable, and bare copper strand—were provided for the installation. Lighting, ventilating and other functions all receive their power through, and are controlled by, Roebling Cable.

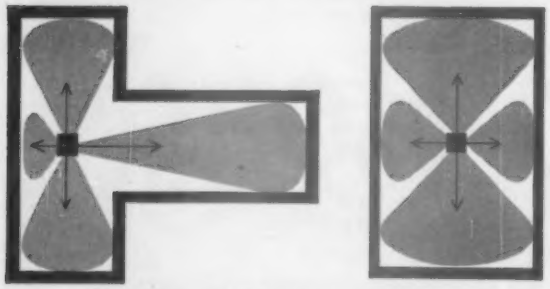
Experienced project and construction designers and engineers know the long-life dependability that is built into Roebling Cables. They know, too, that there's a Roebling Cable for every electrical and telephone application. See your nearby distributor or write Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

ROEBLING

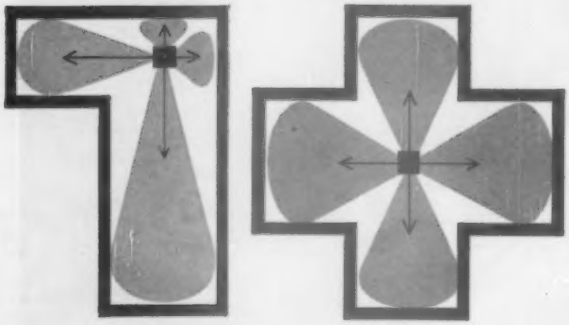
Branch Offices in Principal Cities
Subsidiary of The Colorado Fuel and Iron Corporation

For more facts circle 629 on Reader Service Card

How one "Clover Leaf"



does the work



of two or more conventional heaters

Just one of Carrier's exclusive "Clover Leaf" Unit Heaters with variable 4-way air distribution effectively heats up to 8000 square feet of floor area. Carrier's greater, more flexible coverage means fewer units are needed, resulting in impressive savings in first cost, installation and upkeep. For steam or hot water, in 8 sizes: 55,000 to 600,000 Btu/hr.

For a complete catalog on the "Clover Leaf," call your Carrier manufacturer's agent. Look in the Classified Telephone Book under "Heaters—Unit." Or write Carrier Corporation, Dept. UH, Syracuse, New York.

Complete Line of Unit Heaters. Over 50 years' leadership in temperature control! Carrier knows heating!

Carrier

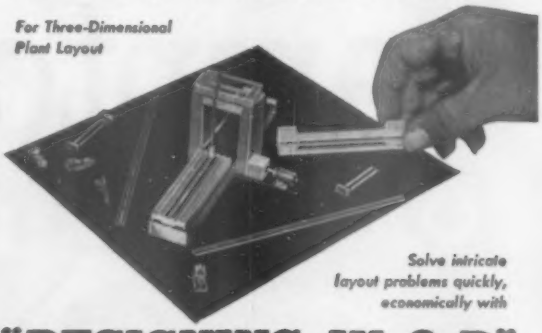
Industrial heating • air conditioning • refrigeration

 For more facts circle 630 on Reader Service Card

NEW! **MACHINE TOOL**

ASSEMBLE-IT-YOURSELF KITS

For Three-Dimensional Plant Layout

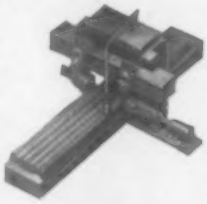


Solve intricate layout problems quickly, economically with

"DESIGNING IN 3-D"

***DO-IT-YOURSELF* Three-Dimensional "Drafting"**

Now Scott Industries brings you assemble-it-yourself machine tool kits scaled-to-size for more economical, more effective plant layout in three dimensions. Scott Industries offers you thousands of kits plus thousands of extra parts, such as pipe, fittings, motors, etc. which your own men can economically assemble to solve your plant layout problems. Scott Industries offers you the convenience and economy of one source of supply plus the services of *local* custom model making. Either way you save money.

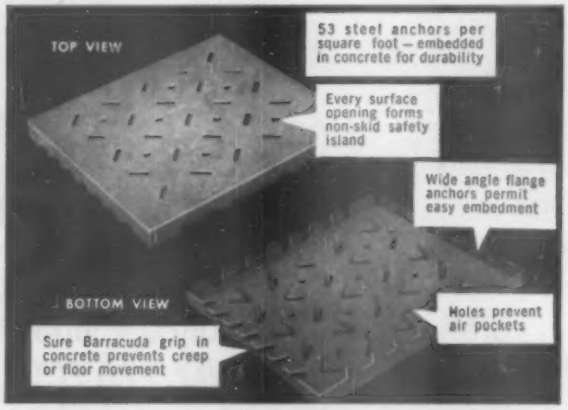


Write for full information on "Designing in 3-D" and complete catalog of kits and parts.

SCOTT **INDUSTRIES, INC.**

Dept. FM-11, Olean, N. Y.

For more facts circle 631 on Reader Service Card


TOP VIEW
53 steel anchors per square foot — embedded in concrete for durability
Every surface opening forms non-skid safety island
Wide angle flange anchors permit easy embedment
BOTTOM VIEW
Holes prevent air pockets
Sure Barracuda grip in concrete prevents creep or floor movement

ANCOR ROLLED STEEL FLOOR PLATES

FOR SAFE, QUIET, DURABLE INDUSTRIAL FLOORS

Low in initial cost . . . still lower in long-term cost, Ackermann's Ancor Floor Plates are rugged enough for any industrial floor because they're made of die-punched rolled steel and every square foot of Ancor Plate is bonded to the concrete floor base by 53 separate anchors.

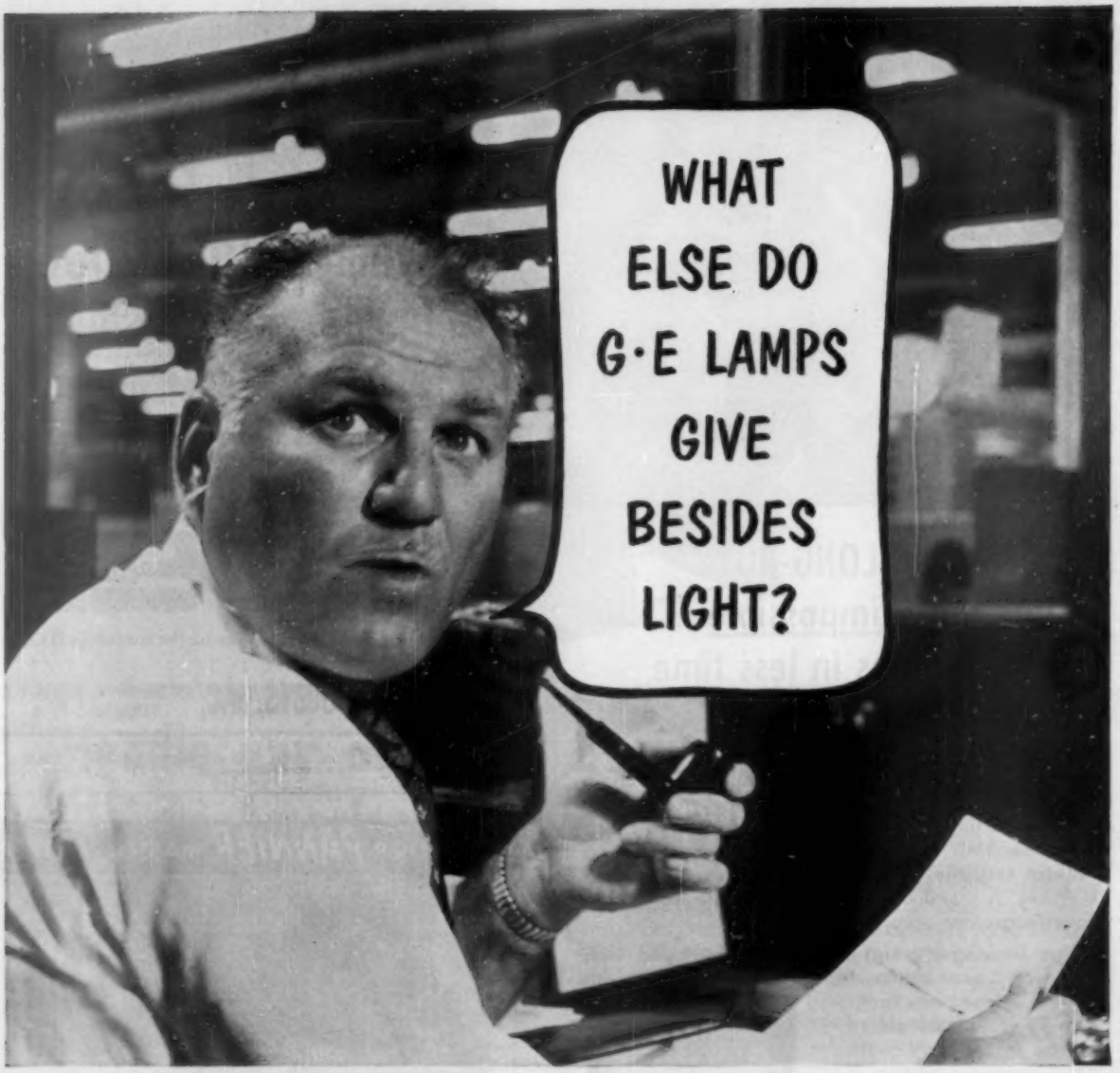
What's more, Ancor Plate's construction provides *33 non-skid concrete safety islands per square foot of floor area.* Yet this permanent safety surface is so smooth that it entirely eliminates the noise, clatter and bumps associated with many other types of steel flooring!

Get full details by writing Ackermann Manufacturing Company, subsidiary of Wheeling Steel Corporation, Wheeling, West Virginia.

WHEELING STEEL

IT'S WHEELING STEEL

For more facts circle 632 on Reader Service Card



IF you use G-E Lamps you get *lots* more. General Electric's staff of nearly 500 lamp specialists and engineers are ready to help General Electric Lamp users.

1. Spotlight A Building Or Use Black Light On Outdoor Signs. G-E specialists will help work out solutions for all kinds of specific lighting jobs . . . as well as help plan new lighting systems and relighting of existing buildings.

2. Work Faster, Work Closer. The right inspection lighting is paying off in places like tool shops, textile mills and the like.

3. See Colors As They Really Are. G-E engineers can suggest lighting especially designed to improve color rendition—ideal for stores, art and photo studios.

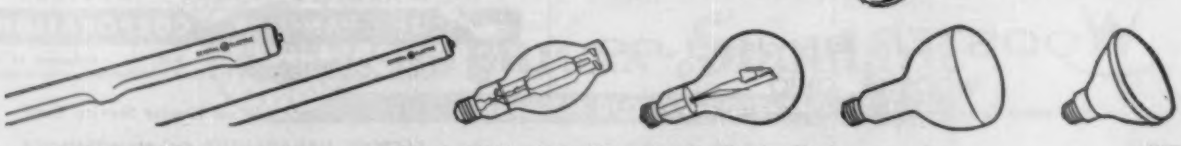
4. Cut Maintenance Costs. Your General Electric specialist will help work out the right lighting maintenance program for your plant, office or store.

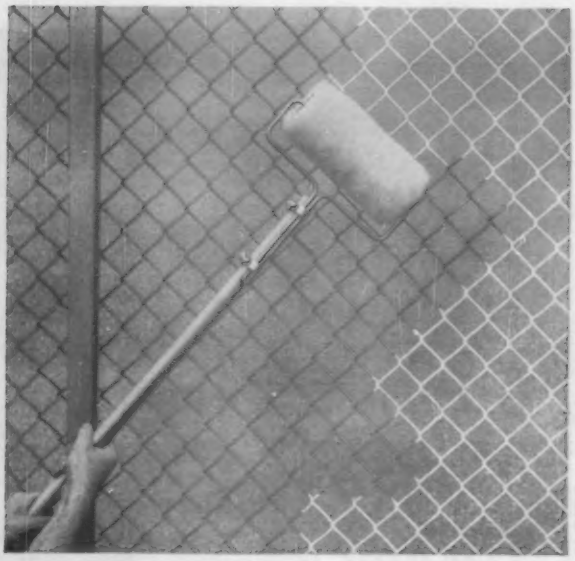
5. The Right Lamp At The Right Time. To insure fastest ordering and delivery service General Electric consigns lamps to your local supplier—and backs him up with over 20 million lamps in warehouses all over the country.

See your local supplier for help on how lighting can reduce accidents, cut rejects and improve "housekeeping". He'll enlist the aid of the right G-E Large Lamp Specialists. (C-843)

Progress Is Our Most Important Product

GENERAL ELECTRIC

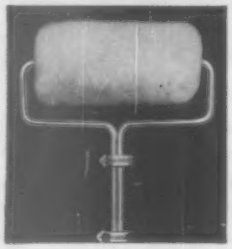




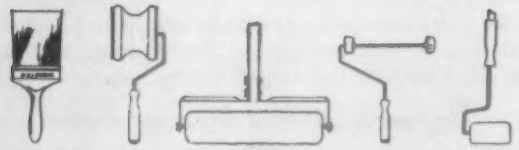
WOOSTER'S "LONG-BOY"® paints those impossible rough surfaces in less time ... without paint loss

Wooster's Long-Boy Maintenance Roller paints chain link fence, corrugated metal and uneven masonry in half the time . . . with half the effort of a brush job. The 1¼" electrified lambswool cover has a natural resiliency to work in and around uneven surfaces . . . and because it holds more paint, you cover a greater area.

Nylon bearings, strong steel frame equipped with two worm gear clamps for attaching to any length handle. A complete Long-Boy Kit includes 2-gallon metal paint tray with paint spreader screen.



Order now from your Wooster distributor . . . and be sure to ask him about these other time-saving Wooster maintenance tools.



Exploded-Tip Brushes ® | Wooster PipeKoter | Wide-Boy Rollers | Wooster "Pro" Frame | Wooster Traffik Liner

WOOSTER BRUSH CO.

WOOSTER, OHIO

For more facts circle 634 on Reader Service Card

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Only DAZZO Dock Shelters provide quick and full protection for dock operations in bad weather. Less than full protection is merely money wasted!

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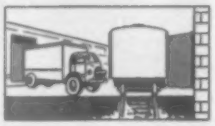

Save *money* and *grief* . . . write for the facts about DAZZO Dock Shelters today!

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HOUSINGS

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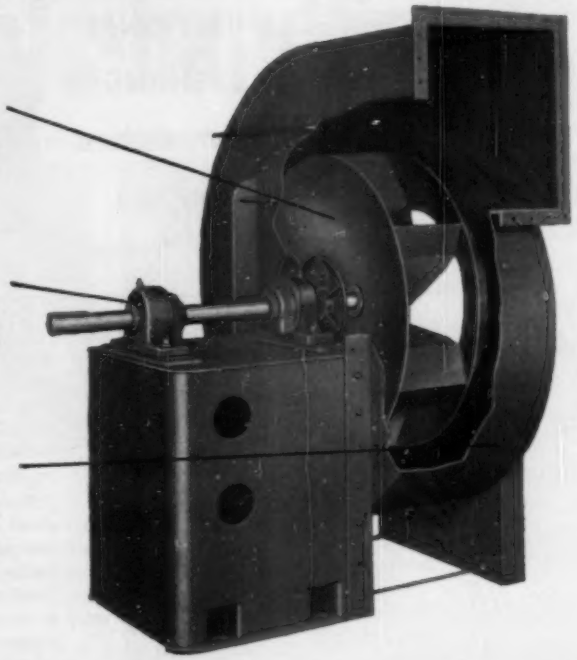

AIR HANDLING
Type AH

MATERIAL HANDLING
Type MH

LONG SHAVINGS
Type LS

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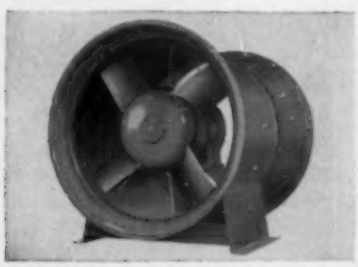
It pays to standardize on American Blower fans for every duty!

HS Fans—direct or V-belt drive, medium-speed operation; nonoverloading.

Sirocco Fans—low speed, quiet operation; move more air per revolution.



Axial Fans—move high volumes in minimum space; flexible installation.

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AMERICAN-Standard
AMERICAN BLOWER DIVISION

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BY THE THOUSANDS

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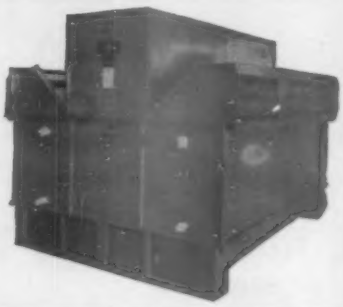
INVESTIGATE THE APPLICATION OF A THOMSON CUTTING and CREASING PRESS TO YOUR PRODUCTION LINE

THOMSON-NATIONAL PRESS COMPANY, INC.

Franklin, Mass., Tel. Franklin 200

NIAGARA SECTIONAL *Aero* HEAT EXCHANGER gives close temperature control, saves you LABOR, Power, Water



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- **Because new features keep your equipment working for long life with "new plant" efficiency . . . always full capacity.**
- **Because you save 95% of cooling water cost.**

You get faster, more accurate cooling of industrial fluids to specify temperatures.

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Write for Niagara Bulletin No. 132

NIAGARA BLOWER COMPANY

Dept. F-11, 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities of U. S. and Canada

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materials-handling news

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

Handles 1.25 million lbs. of paper a day

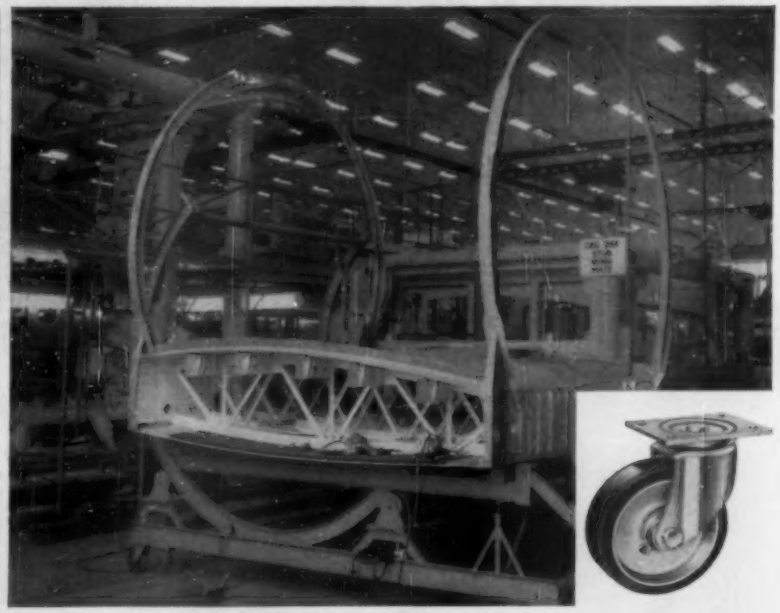
Philadelphia Bulletin's huge new plant uses an infloor dragline system, carts equipped with Bassick casters, to unload, store, and transport one-ton rolls of newsprint. Lewis-Shepard, a leading materials-handling equipment manufacturer, selected Bassick casters for the carts. Casters have to be built for top performance, low maintenance and long life when an expert in the field chooses them. A point worth remembering next time you need casters.

Mother substitute rides casters

Using a caster as the rear landing gear of a decoy, Dr. E. H. Hess, Associate Professor of Psychology at the University of Chicago, studies duck behavior patterns and possible human parallels. The Hess decoys, wired for sound and moving by remote control are used to discover how very early impressions affect duck's later social patterns.

New ideas with casters

Your local distributor who handles Bassick casters can often suggest new ways of moving materials that may save you time or money. He can also recommend the most efficient caster for your specific job and keep you up to date on new caster developments applicable to your operation. Call on him . . . he'll be glad to work with you and, where advisable, call in a Bassick Field Engineer for consultation. 8.43



Casters aid PRODUCIBILITY of Lockheed prop-jet Electra

This short-to-medium-haul aircraft was designed for producibility. It had to be if agreements for performance, price and delivery were to be held firm.

Every production step at Lockheed Aircraft Corporation, Burbank, California, was planned to save time, save materials, save money.

That's why we're especially pleased that so many Bassick casters were used in assembling the Electra . . . and that they were used in so many ways. Typical is the mid-body wing cell, the Electra's central structural member, shown on Bassick casters above.

Keeping costs down on your production job . . . or any materials handling job, for that matter . . . starts with careful planning. And that's the point at which Bassick distributors or Bassick Engineers can help you most. Call on them.

Plant model sectionalized on casters

Sikorsky Aircraft, Division of United Aircraft Corporation has built the scale model of their plant at Stratford, Connecticut, on a sectionalized table. Each section rolls away on Bassick grooved wheel casters to give personnel access to center portions, otherwise hard to get at. With casters operating on inverted angle iron tracks, the sections roll back into exact position. This way you can make a model big enough to work with and yet get inside for close work.

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STRATHMORE

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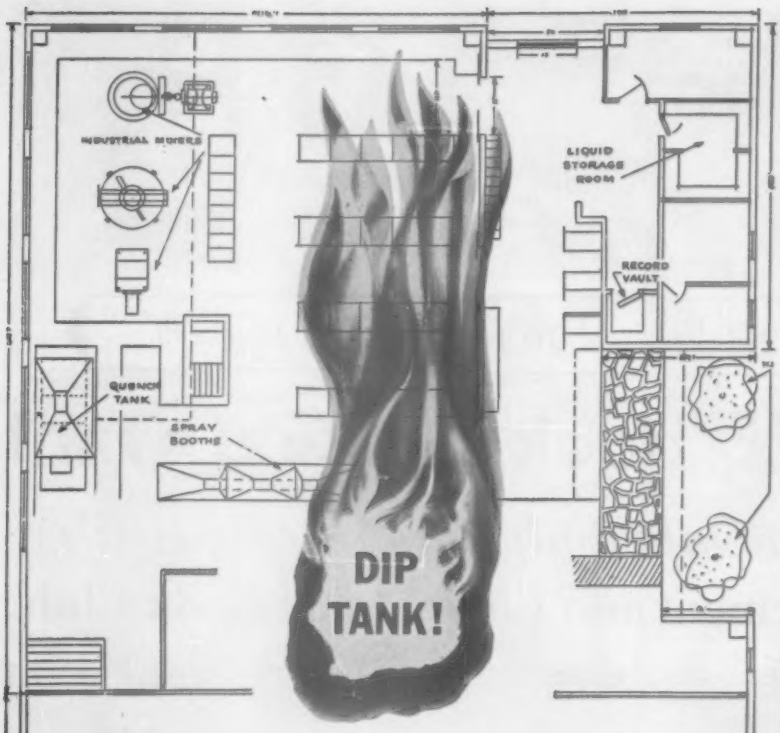

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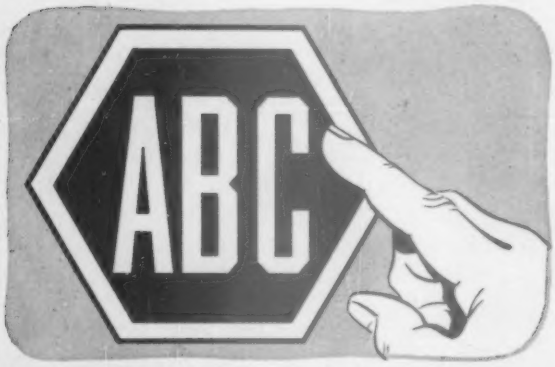

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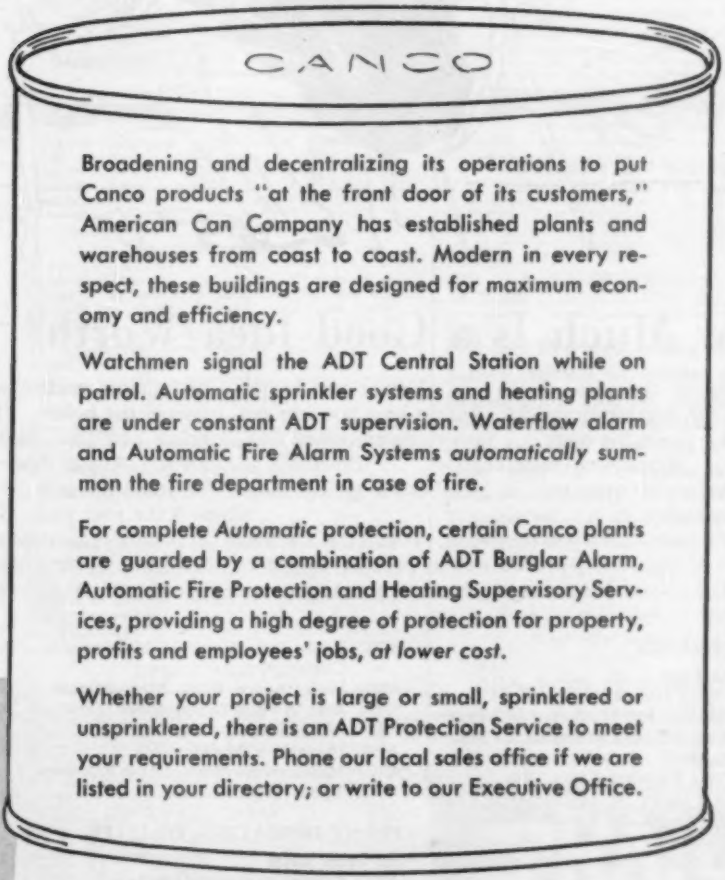
adopted ADT protection for 69 plants and warehouses



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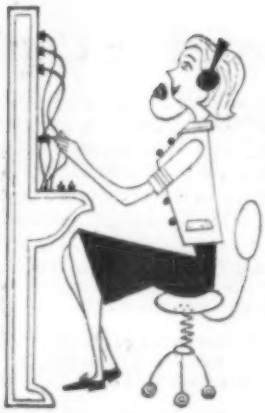

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FREE EDITORIAL FILE COPIES — FC-10 FC-11 FC-12 FC-13 FC-14 FC-15 FC-16 FC-17 FC-18

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Catalogs In This Issue

To help you, here is a list of catalogs described in this issue. To obtain, circle key numbers on either postcard.

PRODUCTION

1—Boring, Milling Machine
2—Airless Spray Process
3—Power Strap Feed Assembly
4—Strapping Equipment
5—Ultrasonic Cleaners
6—Crucibles for Metal Melting
7—Drills
8—Tumblers
9—Power Presses
10—Resin Dispenser
11—Holding Devices
12—Drills

MATERIALS

13—Steel Tubing
14—Ebullient Cooling
15—Magnetic Rubber
16—Urethane Rubber
17—Felt Insulation
18—Manufactured Graphite
19—Precast Concrete Panels

MECHANICAL

20—Shaft-Mounted Speed Reducers
21—Shaft Seals
22—Gear-Shift Drive
23—Mechanical Seals

MATERIALS HANDLING

24—Hoists, Cranes
25—Fork Trucks
26—Vibrating Feeders
27—Conveyor Control
28—Hand-Operated Cranes
29—Electronic Tractor

INSTRUMENTS AND CONTROLS

30—Standard Controls
31—Instrumentation Recorders
32—Sealing Glands, Assemblies
33—Flow Switches
34—Photo-Electric Controls
35—Pressure Transducers
36—Rotameters
37—Process Instrumentation

VALVES, PIPES, AND FITTINGS

38—Service Regulators
39—Pipe and Fittings
40—Compression Packings
41—Forged Steel Unions
42—Internal, External Pump

ELECTRICAL

43—Circuit Breakers
44—Motor Control Centers
45—Aluminum Rigid Conduit
46—Generator Set
47—Metal-Clad Switchgear
48—Rectifier Power Units
49—Duct Systems
50—Automatic Units
51—Switches

VENTILATING, AIR CONDITIONING

52—Air-Moving Units
53—Automatic Controls
54—Tubeaxial Fans
55—Roof, Sidewall Ventilators
56—Cooling Coils

AUXILIARY

57—Filters
58—Pumps, Conveyors
59—Dust Collector
60—Centrifugal Pumps

MAINTENANCE

61—Pipe Insulation
62—Metal Treatment for Rust
63—Heaters and Devices
64—Lubricants
65—Trestles, Scaffold Accessories
66—Gas Appliances

MISCELLANEOUS

67—Dermatitis Prevention Rules
68—Weed, Brush Killers
69—Sterilization
70—Nuclear Reactor
71—Equipment Leasing
72—Uniforms
73—Book-Case Shelving

Here's Why Square D's New Adjustable

ALUMINUM FEED-IN DUCT

makes a lot of sense to me!

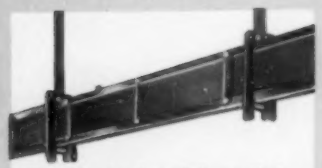
Needed-Rush!
85 feet; 3½ inches
1000 Amp, 3ϕ4 wire
Feed-In Duct

Telescoping joints with multiple slots permit infinite adjustability up to 12 inches when other than standard lengths are required. Standard elbows, T's and X's telescope up to 6 inches!

Fast delivery because any length requirement can be met with standard 3, 5, 7, or 10 foot lengths, plus telescoping joints

Faster to install • Above photo of fixed joint shows simplicity of design—symmetrical ends—less bars per phase—fewer connections—outward-facing captive bolts

Completely adjustable after it's hung. For example, if two ends terminate 6½ inches apart, connection can still be made with a telescoping joint



Totally enclosed for safety —at no price premium. No de-rating necessary. Square D's design eliminates need for ventilation

MORE DESIGN FEATURES

- Thinnest cross-section available! Tight spots, pipes and structural members present less problems
- Easy transposition of phases, using standard telescoping joint parts, for maintaining balanced voltage on long runs
- Certified short circuit tests by an independent testing laboratory have proved the superiority of Square D's continuously-supported bus design

Write for the complete story
Address Square D Company, 6060 Rivard Street, Department SA, Detroit 11, Michigan

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

SQUARE D COMPANY

For more facts circle 447 on READER SERVICE CARD

U. S. Army photo

Why is a missile like a wheelbarrow?

IT might seem strange that one of the simplest means of transportation and one still in the future should have anything in common. But they do. Both have rotating parts. And both have Timken® tapered roller bearings.

Wherever any parts rotate in your equipment, on road machinery, cranes and machine tools, you'll find Timken tapered roller bearings. They practically eliminate friction—easing the path of motion, whether it be moving a third of a yard of mortar or a space satellite into orbit.

Timken bearings are made to various degrees of precision—more than ample precision for use in ordinary machines, jewel accurate for specialized, fine machinery. Their tapered design means they take loads from all directions—eliminate the need for bulky thrust devices. And full-line contact between rollers and races give Timken bearings extra load-carrying capacity.

Because Timken bearings are precision made (we even make our own steel to make sure we start with the best) they give long life with minimum maintenance. They keep production up and costs down.

Make sure you get all these advantages in the machines you buy or build. Specify Timken tapered roller bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.

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